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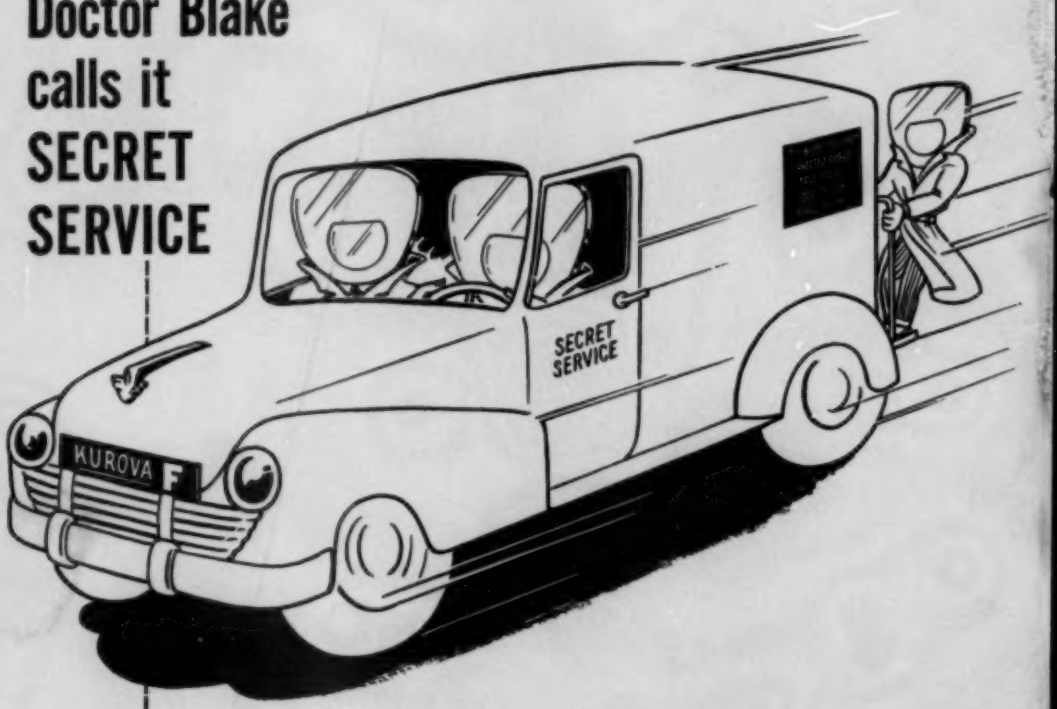

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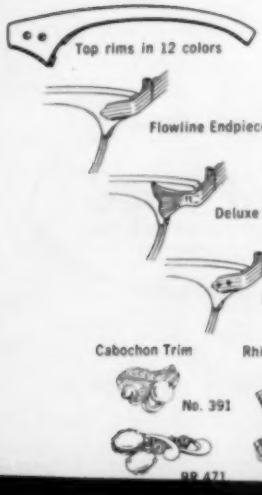

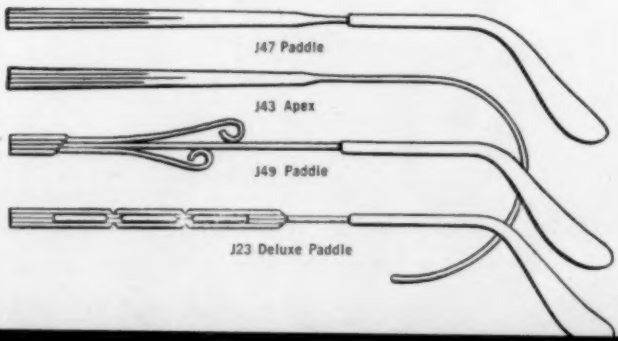

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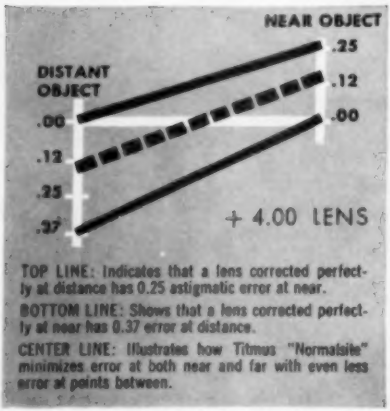

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CONSTANCY OF THE ACA RATIO*

Clarence W. Morris†
Fort Wayne, Indiana

Since the introduction of the concept of the ACA as a stable function, the optometric profession has been divided into two groups. There are those who think that the ACA is stable and there are others who argue that the ACA is variable. In 1954 Manas and Shulman[1] reported on a series of periodic measurements of the ACA for twenty-two subjects. On twenty days, they measured the ACA ratio using the techniques of Morgan and Fry. In this experiment the ACA, when measured by these techniques, proved to be variable. Therefore, Manas and Shulman concluded that the ACA is a variable function and that it is closely related to variability of the near point phoria.

The only published criticism of the point of view taken by Manas and Shulman was that the variability of the ACA ratio, when measured by the Fry and Morgan techniques, was due to experimental or observational error. This objection was raised by Hirsch[2] and Westheimer.[3]

The technique of taking phorias employed in this experiment leaves much to be desired. For example, taking a phoria with a base-out approach is not recommended in graphical analysis. Whatever other criticism might be directed against the technique employed by Manas and Shulman, it still would seem relatively difficult to explain the high degree of variability on the basis of experimented error alone.

During the past several years, I have used the concept of the ACA as a stable entity and the clinical results have been consistently satisfactory. So far I have seen no evidence for thinking that the ACA is a variable when it is properly measured and evaluated. I have found that the Fry and Morgan techniques are clinically unreliable in the presence of any anomaly of the accommodative-convergence mechanism. If we have a patient with emmetropia, orthophoria and with normal ACA and normal accommodative ability, then, I believe the Fry and Morgan techniques could be depended upon to measure the ACA with a

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degree of accuracy that would be clinically reliable. However, the practice of optometry is concerned with patients who have visual problems and therefore any technique designed to measure the ACA must be one which will stand up with a satisfactory degree of clinical accuracy when anomalies of the visual mechanism are present. Therefore, in my opinion, Manas and Shulman have not proven that the ACA is a variable. They have proven that when the ACA is measured by the Fry and Morgan techniques a high degree of variability has resulted. If this variability is the proof of anything, it proves that these two techniques are unreliable clinically.

Any evaluation of this problem should begin with an investigation of the definition of the ACA. At the present time, the ACA is presumed to be measured precisely by a haploscope by which the actual amount of accommodation resulting from a stimulus to accommodation, is measured. However, Westheimer[4] confesses that even with haploscopic data, a measure of variability will be found. The following fraction represents that which the profession has accepted as the best definition of the ACA at this time.

$$\frac{\text{ACCOMMODATIVE-CONVERGENCE}}{\text{ACTUAL ACCOMMODATION PRODUCED}}$$

The optometric practitioner, who must work without a haploscope, measures only the stimulus to accommodation. The relation between the stimulus to accommodation and the actual accommodation produced is a variable. Therefore, with the measurement of the ACA by the Fry and Morgan techniques we have introduced a variable factor by substituting the stimulus to the accommodative mechanism in the place of the actual amount of accommodation produced. Therefore the fraction representing the ACA in this event becomes as follows:

$$\frac{\text{ACCOMMODATIVE-CONVERGENCE}}{\text{STIMULUS TO ACCOMMODATION}}$$

This problem is further complicated by the introduction of the concept of accommodation effort. Hill[5] believes that the direct stimulus to accommodative-convergence is accommodative-effort and not the actual amount of accommodation produced. Maddox[6] reported likewise that accommodative-convergence was related to accommodative effort and not to the actual amount of accommodation produced. He reported that with the instillation of weak atropine solution the ciliary muscle was rendered less responsive to motor stimulation and therefore more accommodative-effort was required to produce the same amount of accommodation. The increased accommodative-effort was in turn believed to be the explanation of an increase in accommodative-convergence or esophoria. On the other hand, with the instillation of

eserine in a weak solution, the ciliary muscle was made more responsive to stimulation and as a consequence the same amount of accommodation was produced with less accommodative-effort. Consequently less accommodative-convergence was produced. If the theory of accommodative-effort is valid, the true fraction representing the ACA would become:

$$\frac{\text{ACCOMMODATIVE-CONVERGENCE}}{\text{ACCOMMODATIVE-EFFORT}}$$

Hill,[7] believes that the relationship between the actual amount of accommodation produced and the factor of accommodative-effort has a 1:1 relationship in infancy but "—usually does not retain the same ratio in adulthood." It could be assumed, therefore that, as the individual ages and the amplitude of accommodation diminishes with age, the amount of accommodative-effort required to produce a given amount of accommodation will increase. If this be true, there might be a cor relation between age and the ACA.

The theory of accommodative-effort may provide an explanation for the observation of Alpern[8] who stated that, "—when the ciliary muscle becomes partially paralyzed, the eye not only loses its ability to accommodate but the ACA ratio increases and the amount of increase in the ACA ratio is an indication of the extent of the paralysis of the ciliary muscle." Furthermore, the concept of accommodative-effort may also provide an explanation for the tail extending to the right at the upper corner of the field of clear single binocular vision.

Morgan[9] criticised the phoria method as being more unreliable than the direct measure of the ACA by the gradient method, because the phoria method includes the factor of proximal convergence. However, Manas and Shulman[10] find that the coefficient of variability with the gradient or Morgan technique was 43.9 and with the phoria or Fry technique it was only 19.9. This is, in my opinion, of considerable importance because I take this to mean that in the use of the gradient method, the profession has failed to recognize the two factors which have contributed to this higher degree of variability. The first factor is the anomaly of low ACA ratio. Compensation for a low ACA is achieved by the fusion mechanism and the ciliary mechanism. Of course the major portion of the compensation is effected by the fusion mechanism but the ciliary muscle is stimulated somehow to produce added accommodation which facilitates the efforts to meet the excessive demand upon fusion convergence by a slight increase in accommodative-convergence. For this reason, the plus lens to blur will be high and the minus lens to blur will be low. If an attempt is made to measure the ACA with a plus lens gradient, the result will be much greater than

the ACA and if the minus lens gradient is employed to measure the ACA, the result will be considerably less than the actual ACA ratio.

If the Fry or phoria method of measuring the ACA ratio is used when the anomaly of low ACA is present, the compensation for a low ACA by the fusion mechanism will simulate a normal or even high ACA ratio. Thus, in either case, the anomaly of low ACA ratio will cause either the phoria or gradient method of measuring the ACA to give an entirely misleading evaluation of the ACA ratio.

The second factor which has contributed to the excessive variability is the factor of accommodative-effort. Accommodative-effort will be provoked whenever the accommodative mechanism operates under stress. The conditions which can provoke accommodative-effort are present when the patient attempts to do close work when latency, subnormal accommodation, or presbyopia are inadequately corrected.

The most formidable criticism of the stability of the ACA is found in the paper by Manas.[11] Manas quotes Adler[12] on Perlia's nucleus, "—there is surprisingly little clinical evidence that it is the center for convergence. For the present, this will have to remain an assumption." On the other hand it is possible to quote another authority with a contrary opinion. Duke-Elder[13] writes, "The median nucleus of Perlia is almost certainly concerned with convergence." Adler assumes that Perlia's nucleus is not the center for convergence and Duke-Elder assumes, with perhaps a little more evidence of confidence, that Perlia's nucleus is concerned with convergence. Therefore, the impartial reader must conclude that no irrefutable proof for either point of view can be obtained at this time from neurological or anatomical evidence.

Likewise, with reference to the Edinger-Westphal nucleus, Manas again quotes only Adler who wrote, "No proof has yet been given that this nucleus has to do with accommodation." The quotation from only one authority favorable to the point of view advocated by Manas would leave the reader, if he did not know the literature, with the impression that there was no evidence to the contrary. Again we quote Duke-Elder[14] who writes, "The accessory nucleus of Edinger-Westphal is still a matter of controversy. . . . All considerations tend to associate it with the function of accommodation and the movements of the pupil. Clinical data point to the same conclusion. The occurrence of ophthalmoplegia externa and interna, so frequently independently and equally frequent in association, suggests that the nuclei subserving the external and internal musculature of the eyes are separate, but at the same time nearly related. Most neurologists locate the centre for the internal muscles in the Edinger-Westphal nucleus, and there is considerable

amount of evidence derived from stimulation and ablation experiments, and clinical and post-mortem findings in man, that this is the case. The matter, however, is not all one sided, and conflicting evidence can be gathered from the literature."

Likewise, Hill[15] accepts the concept of the stability of the ACA ratio. His definition of the ACA differs from that generally accepted by the optometric profession in that it relates accommodative-convergence to accommodative-effort rather than to the actual amount of accommodation produced as a result of a given stimulus to accommodation. He writes, "Accommodative-effort appears to retain its constant quantitative stimulatory relationship. This is characteristic of a phylogenetically inherited reflex."

Under the title of "developmental" Manas seeks by reference to the ontogenetical factors to substantiate his thesis for the variability of the ACA. However, Duke-Elder reports all the data from ontogeny and phylogenesis, and in spite of this fact is inclined to accept a different interpretation of the functions of the neurological structures involved in this discussion. Thus far we have considered the first, second, and third conclusions in the summary by Manas in his paper on "Inconstancy of the ACA Ratio."

With regard to the fourth conclusion of Manas that there is a relationship between age and the ACA, the evidence that I have been able to discover in the literature is conflicting and inconclusive. With respect to the factor of accommodative-effort and the observations of Hill, I would expect with age and a reduction of the amplitude of accommodation there would be an apparent increase in the ACA resulting from an increase in accommodative-effort as the lowering of the amplitude of accommodation continues with age. On the other hand, Alpern and Hirsch[16] report a slight reduction in the ACA with age. However, in either case, the clinical significance of a correlation between age and the ACA, if any, will not be comparable to that variability with respect to the Fry and Morgan techniques. An adequate solution to this problem will be found when haploscopic measurements of the ACA from year to year on a substantial number of patients over a long span of years becomes available. Due to the necessity of continuity of effort over a long period of years, such a project could best be handled by an organization of some kind such as the American Academy of Optometry or a School of Optometry.

The fifth, sixth, and seventh conclusions of Manas, are based on data in which the Fry technique was employed to measure the ACA. The eighth conclusion was based upon data from measurements of the

ACA by the Morgan method. Therefore, no further comment upon these is necessary other than to say that the Fry and Morgan techniques for measuring the ACA can be assumed to be unreliable clinically. Until such a time as an investigator measures the ACA upon a substantial number of patients using the Fry and Morgan techniques and the correlation of such measurements with haploscopic measurements proves that the Fry and Morgan techniques are reliable, these techniques are vulnerable to criticism.

If the Fry and Morgan techniques for measuring the ACA are found to be clinically unreliable for measuring the ACA, how then shall the optometric practitioner measure the ACA? If a clinical model of a haploscope were available, that would be the best method. But since that is not available, the next best method is the determination of the ACA by graphical analysis in connection with a study of the field of clear single binocular vision.

My technique for measuring the field of clear single binocular vision differs slightly from the technique commonly employed. It has been influenced by the traditional concept of optometric practice that it is desirable for all measurements of eye functions to be made under the same conditions as will obtain when the patient will be wearing the lenses to be prescribed. It is unnatural to have accommodation adjusted for one distance and convergence for another distance; therefore, I use no plus or minus auxiliary lenses. For every accommodative level at which I wish to take data, I set the target at the actual distance corresponding to that accommodative level. For the average patient, the field of near vision is seldom closer than four diopters or 25 cm.; therefore, I have not attempted to work at higher levels of accommodation. On the other hand, when working with the present types of refractors with small lens aperatures, the possibility of working at any distance closer than 25 cm. is severely restricted by the physical limitations of the equipment. If we attempt to work at higher accommodative levels it would be necessary to resort to auxiliary minus lenses and in the presence of presbyopia, latency, subnormal accommodation, and low ACA, the use of minus lenses will result in unreliable data. My technique might be questioned because I explore only the lower half of the field of clear single binocular vision. That, in my opinion, is the best that can be done with present equipment.

When the use of the actual distance corresponding to a desired accommodative level is employed, the diagnostic techique known as graphical analysis becomes greatly simplified. At each accommodative

level five tests are made. These tests are made every day by optometrists at 6M. and 40 cm. They are as follows:

(1) Phoria.
(2) Plus lens to blur.
(3) Minus lens to blur.
(4) Prism base-in to blur, break, and recovery.
(5) Prism base-out to blur, break, and recovery.

At 6M. the plus lens to blur is not ordinarily made but all five tests are made at all other distances which are as follows:

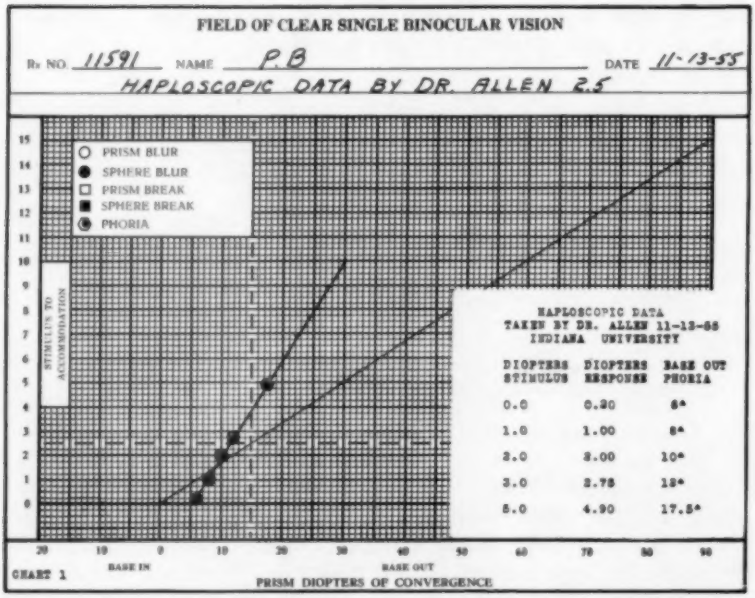
DISTANCE	ACCOMODATIVE COORDINATE	CONVERGENCE COORDINATE
6M.	0.00 Diopters	0.00Δ
100 cm.	1.00 Diopters	6.00Δ
66 cm.	1.50 Diopters	9.00Δ
50 cm.	2.00 Diopters	12.00Δ
40 cm.	2.50 Diopters	15.00Δ
33 cm.	3.00 Diopters	18.00Δ
28 cm.	3.50 Diopters	21.00Δ
25 cm.	4.00 Diopters	24.00Δ

Graphical analysis plotting of data is done by adding or substracting each datum from its corresponding coordinate, according to the plus or minus signs thereof. The above accommodative and convergence values are plus values. Minus accommodative coordinate values are below the base line and minus values of convergence coordinate are to the left of the zero position on the base line. Esophoria, minus lens to blur, and prism base-out are plus values. Exophoria, plus lens to blur, and prism base-in are minus values.

My technique differs in two respects from that commonly recommended. First, I use the flash technique of exposing the upper target when taking a phoria, but I continue the base-in approach in order to bracket the recorded phoria with a "left" and a "right" response if at all possible. Secondly, I permit the orientation of the phoria line to be determined by the phorias between 1.5 and 3.5 diopters if the phorias do not approximate a straight line. That is, I will draw a phoria line which intersects the zero accommodative level at a place to the right of the 6M. phoria. This becomes necessary to represent the basic physiology in the case of the low ACA, for example.

Anyone, who is interested in improving techniques in graphical analysis, will be interested to know that Allen of Indiana University has devised a near point test card which permits an improvement in the technique of taking ductions. "Duction findings involving high prismatic values will not be influenced by the chromatic dispersion of the prism and will be almost exactly comparable to the plus and minus lens to blur data, since the criterion of blur will be the same."

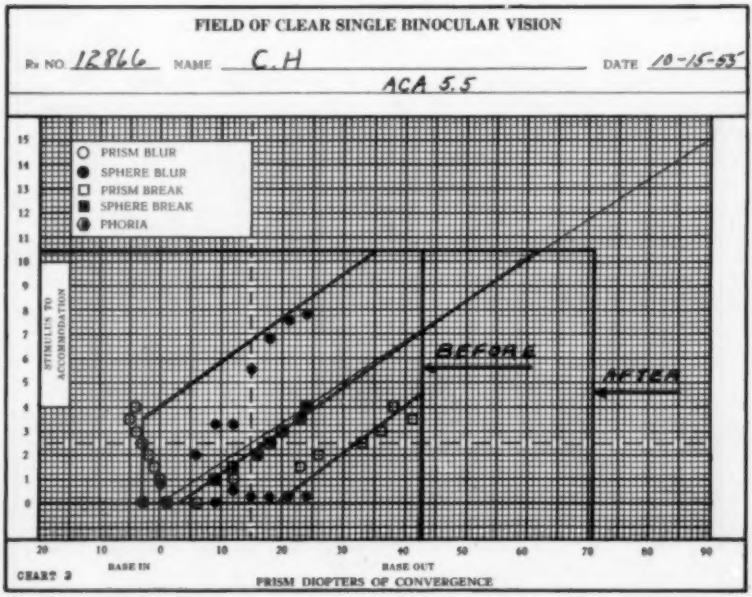
Over a period of several years, I have used the above technique



and have found that I could achieve what I think are dependable and satisfactory clinical results. Graphical analysis is not used on every case but it is reserved for those few cases where some anomaly of the accommodative-convergence mechanism is suspected. The use of graphical analysis for every patient complicates what might otherwise be a simple case. The problem is to know when and when not to resort to graphical analysis or other specialized testing. The discussion of that question would exceed the space limits of this paper.

Again the disposition of a suspected case of low ACA may at times be varied from the routine. If for any reason any extensive testing is contra-indicated by factors other than eye considerations, I will measure a series of phorias rather than make a complete study of the field of clear single binocular vision. I will omit the 100 cm. test for time considerations and calculate the ACA upon the basis of seven phorias. This method with its repetition of tests at seven or eight accommodative levels, provides the patient with an opportunity to become a trained observer and thus the accuracy of the work is improved.

There is some reason to believe that the accuracy of this method



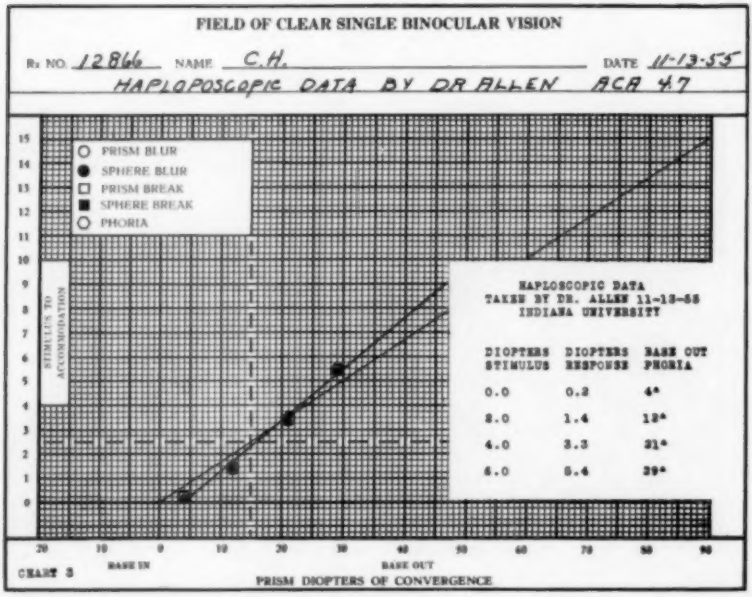
may be better than might be expected. So far I have but three patients where I can compare the results of this method with haploscopic data. I shall present two cases. The other I shall reserve for presentation in connection with a discussion of low ACA.

In 1954, Morris[17] published a case report dealing with a low ACA and color aberration. In this article two determinations of the ACA ratio were reported.

CHART NO. 4	2.7
CHART NO. 5	2.6
Sum	5.3
Average	2.65

On November 13th, 1955, this patient (Rx. 11591) was taken to Bloomington where Allen made a haploscopic determination of the ACA. My evaluation of the haploscopic data is found on Graph No. 1 where the ACA is 2.5. The difference between my average of 2.65 and 2.50 is 0.15.

On Graph No. 2, I found the ACA to be 5.5 and the corresponding data by Allen with haploscope is found on Graph No. 3. The haploscopic data does not follow on a straight line and assuming that 4.7 is the average, then my determination of the ACA on patient 12866



is again less than the haploscopic average by only 0.80. My data exceed the ACA as determined by haploscopic data for these two patients by 0.15 and 0.80. The excess found in my measurements of the ACA is due to the fact that the factor of proximal convergence is included. Two cases on which to base a correlation between my technique and haploscopic technique is obviously inadequate. But the data do suggest a basis for thinking that the Fry technique, in spite of the factor proximal convergence, is more accurate than the Morgan technique. This in turn suggests that the profession may find in the two factors of low ACA and accommodative-effort the explanation for the excessive variability of the Morgan technique.

I have made extensive clinical tests on more than one hundred patients. I have found the longitudinal type of investigation to be most rewarding. Many patients have been under observation over a period of several years with two or more examinations. The clinical data from this study with respect to low ACA and accommodative-effort as it is found in relation to subnormal accommodation is far too extensive to have been included in this article. The data under these two titles carry forward further the indictment of the Morgan and Fry

techniques as being clinically inadequate to measure the ACA when any anomaly of the accommodative-convergence relationship is involved.

For the past two years, my attention has been directed toward finding the clinical significance of the ACA. I am able to report that, when the ACA is measured by an adequate clinical technique, it apparently is very stable. This apparent stability gives to the ACA new clinical importance and significance. With this concept of the ACA, I have been able in repeated cases to provide optometric relief where before, with the generally accepted clinical techniques and understanding, I had failed to serve the patient adequately.

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NUTRITION, POSTURE, GAIT, FACE AND SKIN*

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Careful observation should arouse the optometrist's index of suspicion not only of refractive disorders but of those disturbances requiring medical referral which might have otherwise been missed or overlooked.

NUTRITIONAL STATUS

The body weight (in relation to height) and the thickness of the subcutaneous fat layer provide a rough index of the interplay of metabolism and nutrition. The thin emaciated individual with his sagging clothes and sagging skin gives notice that either something has gone wrong with his metabolic engine or not enough fuel has been supplied to it. The chronic wasting diseases such as diabetes, thyrotoxicosis, tuberculosis and cancer would certainly have to be ruled out if the weight loss is progressive and unaccounted for by dietary intake. The first two conditions have specific ocular manifestations, the third is nonspecific and the last a variable cause for local ocular damage.

Inadequate food intake in this country is, at present, a relatively rare cause of weight loss, nervous and emotional factors playing a more important role in such cases than unavailability of food. An important exception are the diseases producing dysphagia. Specific deficiencies are more common especially among people who follow certain diets and food faddists. Such deficiencies often lead to specific but rarely pathognomonic findings since usually more than one nutrient is involved. Some of the ocular manifestations of nutritional deficiency are summarized in Table I.

By far the most common cause of obesity is overeating and not endocrinopathy. Some of the endocrine disorders, however, have rather characteristic ocular manifestations which should be considered. Of these the ocular manifestations of pituitary tumors (acromegaly, Froh-

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TABLE I
SOME OCULAR IMPLICATIONS OF DISTURBED NUTRITION AND METABOLISM

VITAMINS
1. Nightblindness
2. Xerophthalmia
3. Blepharitis
4. Optic neuritis
5. Conjunctivitis and keratitis
6. Cataracts
7. Hemorrhage
8. Myopia

MINERALS
1. Hypoparathyroid cataract
2. Hyperparathyroid conjunctivitis
3. Hypochromic anemia
4. Myopia
5. Wilson's disease

CARBOHYDRATES
1. Diabetic cataract
2. Diabetic retinopathy
3. Conjunctivitis
4. Optic neuritis
5. Keratitis

PROTEINS
1. Corneal vascularization
2. Ametropia (?)
3. Cataract (?)
4. Gouty eye manifestations
5. Uremic retinopathy

FATS
1. Lipemia retinalis
2. Atherosclerosis (?)
3. Conjunctivitis
4. Xanthelasma
5. Ametropia (?)

lich's and Cushing's syndromes) should be ruled out by appropriate visual field studies. If one remembers that there is such a condition, the Laurence-Moon-Biedl syndrome will not likely be missed (strongly familial, polydactily, mental retardation and retinal pigmentary degeneration constitute the characteristic features). Obesity must not be confused with pregnancy or with the edema of heart failure, nephrotic syndrome, liver cirrhosis, etc., all of which will usually present other, more important clinical features.

Whatever the cause of obesity, the consequences are similar: increased load upon the heart and circulation; interference with heat loss and increased perspiration; statistical predisposition to atherosclerosis, high blood pressure, diabetes mellitus and a shorter life span. For this reason alone the eyegrounds of the obese patient must be carefully searched for evidence of these complications.

CONTOUR AND SYMMETRY

The body is, within physiologic limits, symmetrically proportional. One makes use of this fundamental fact in clinical observation by comparing one side to the other. Thus an almost imperceptible pallor of the optic disc may be readily apparent if it is compared to the opposite side. But long before we perform our ophthalmoscopic examination we will have noted a hemiplegia, unilateral ptosis or exophthalmos, facial asymmetry, anisocoria, unlateral squint, kyphosis, scoliosis and lordosis to mention only a few of the most obvious disturbances of contour and symmetry. The principle of comparison is so important that we will stress it repeatedly in connection with the ocular examination.

In interpreting variations in contour, age, race and sex variations must be kept in mind. The young clinician is likely to suspect a number of non-existent thyroid conditions when examining his first few negro patients until he learns that the slight proptosis so common in this race is quite within physiologic limits. The importance of asymmetry and comparison is illustrated in Table II.

TABLE II

ASYMMETRY: THE IMPORTANCE OF COMPARISON

ASSYMMETRY OF:	MAY SUGGEST THE PRESENCE OF:
Face	Facial paralysis; Scoliosis; Hemiplegia; Tumors; Sinusitis; Heredity; Herpes Zoster; Trigeminal Paralysis
Eyebrows	Ptosis; Peripheral Facial Paralysis
Palpebral Aperture	Blepharospasm; Exophthalmos; Enophthalmos; Facial Paralysis; Sympathetic Paralysis; Orbital Cellulitis; Tumors and Pseudotumors
Pupils	Oculomotor Paralysis; Horner's Syndrome; Anisometropia; Unilateral Blindness; Lesions in Visual Pathway; Adie's Syndrome
Optic Disc	Papilledema; Optic Atrophy; Optic Neuritis; Foster-Kennedy Syndrome; Coloboma
Cornea	Trauma; Foreign Body; Keratitis; Keratoconus; Opacities; Vascularization
Iris	Iritis; Coloboma; Atrophy; Glaucoma; Unilateral Blindness
Ametropia	Aniseikonia; Amblyopia; Blindness; Strabismus; Cataract and Aphakia; Suppression; Heterophoria; Torticollis
Eyeball	Strabismus; Micro- and Macrophthalmos; Coloboma; Inflammation, Foreign Body; Tumors

POSTURE

It is said that good posture is a habit and, if so, it is one not acquired by a good percentage of the population. The poor posture so common among indoor workers and school children is claimed to be related to the pathogenesis of astigmatism and other visual difficulties. The mechanism by which postural "stress" causes the distortion of the cornea (or is it the lens?) is not clear. Harmon (1951) has studied the effects of lighting, seating and placement of working materials on the posture of school children. Among other things he studied squares drawn by children in various postural alignment and found that "Subjects who exceed the tolerances for postures and other relationships that have been previously stated, will distort their squares or the alignment of their squares according to the laws of perspective, or the laws of optics, beyond their normal distortions by an amount mathematically approaching the amount they are exceeding their tolerances for postural and eye-head-trunk-task relationships."

While the drawing of distorted squares does not constitute evidence of astigmatism or even that it predisposes to astigmatism some authors have already advocated that, unless the posture is corrected, it is

better to leave any existing astigmatism alone since it has developed, so to speak, as a compensatory reaction. While these studies are extremely interesting in terms of their implications for possible prevention, much more work will have to be done to determine just what the relationships are.

The physiologic laws regulating posture and the maintenance of posture were laid down long ago by the epic work of Magnus (1924). In animals as well as in man static and stato-kinetic impulses arising from muscles of the neck, trunk and semi-circular canals influence the position of the eyes. Indeed it appears that these reflexes are designed to maintain the eyes in a fixed position irrespective of the movements of the remainder of the body. The amplitude of these "compensatory" ocular changes is smaller than that of the body movements (e.g., the eyes rotate about 2° for a lateral head tilt of 15°). If one assumes that these torsional movements exceed a certain proportion of their reserve capacity then such movements could easily lead to visual discomfort. It is precisely this same type of assumption which is usually made with respect to lateral ocular movements in explaining the every day type of asthenopia so that such an approach is not unreasonable (even though it has never been proven).

Ellerbrock (1954) has studied the amplitude of induced cyclofusional movements and found them to be quite large. More important he observed spatial distortions which may result from such adjustments all of which makes this subject a very exciting one for continued study particularly from the clinical point of view.

As a final point we should not fail to note the altered head posture which represents a compensatory attempt to maintain single vision in paralysis of those extra-ocular muscles having an oblique component of action. According to Tait (1951) a progressive torticollis may be the first manifestation of oblique phoria in the late pre-school and school ages. This observation thus brings us back to where we started.

The posture of the obese differs from that of the thin person and definite postural changes (enhancement of the lordotic curve) occur during pregnancy. Postural changes secondary to diseases of the spine, lungs, nerves and muscles are described in textbooks of orthopedics and need not concern us here.

GAIT

The gait as the patient walks across the room should be noted. Many neurologists insist upon accompanying the patient into the examining room in order to avail themselves of the opportunity of observing his gait under the most natural conditions.

Walking is a highly complex activity and is not usually developed until about 1 year of age. Since it is the end-result of a whole series of integrated neurologic reflexes, many diseases of the nervous system manifest themselves in some disturbance of gait. The most important of these are ataxia, spasticity and paralysis.

The ataxias are disturbances of movement resulting from damage to the proprioceptive pathways and cerebellum. They interfere with the ability to maintain equilibrium when standing (Romberg test) and are seen in tabes, cerebellar disease and certain hereditary disturbances.

Central (upper motor neuron) lesions such as those seen following cerebro vascular accidents and diseases affecting the pyramidal and extra-pyramidal pathways (e.g., Multiple Sclerosis) result in hypertonia and a spastic gait. The affected limb is stiff and extended, the toes point towards the ground and, in order to avoid stumbling, the patient brings his limb around in an arc of a circle.

Paralysis results from diseases of the anterior horn cells (e.g., poliomyelitis, trauma) or peripheral nerve damage. All muscular movements are abolished and the affected limb becomes thin and atrophic.

The ocular manifestations of some of these disturbances are summarized in Table III.

THE FACE

The most obvious thing about the face is its expression (physiognomy). The facies in health and disease is often dramatic and always informative. Physiologic variation may be seen as a result of fear, anxiety, placidity, melancholy and other emotional turmoils. Racial and sex variations occur and the environment (sun, wind, water) inevitably leaves its mark. The skin of the face, like the skin elsewhere, reflects a variety of external and internal lesions.

A number of facial pictures have been related to certain diseases. The hippocratic facies is one which has for centuries been identified with impending death. Some other more or less typical facies are listed in Table IV, together with their ocular implications.

Certain facial contours are recognized. Thus one speaks of oval, angular, square, round, etc., facial types. Such a classification is useful in evaluating the most cosmetically appealing spectacles. Some of my colleagues make a great fuss over this matter and tell me that their patients, especially the women, are considerably impressed and pleased over this attention to matters of fashion.

That region of the face bounded by the root of the nose above and the corners of the mouth below constitutes a triangle sometimes

TABLE III

SOME OCULAR MANIFESTATIONS IN DISEASES PRODUCING DISTURBANCES OF GAIT

Tabes Dorsalis	Stomping gait on wide base. Looks at his feet. Tends to fall if eyes closed.	Optic atrophy. Argyll-Robertson pupil. Evidence of old chorioretinitis or keratitis.
Cerebellar Disease	Drunken, staggering gait. Tendency to fall towards side of lesion. Not improved if eyes open.	Nystagmus. Papilledema. Diminished or absent corneal reflex. Oculomotor palsy.
Multiple Sclerosis	Incoordination and weakness. Ataxic gait. Intention tremor. Tendency to remissions and exacerbations.	Retrobulbar neuritis and optic atrophy. Earlier may have temporal disc pallor. Nystagmus common.
Cerebrovascular Accident	Extensor rigidity. Circumduction of paralyzed leg with tendency of toe to drag.	Hemianopsia, pupillary changes, oculomotor paresis, orbicularis may show weakness. May be internal ophthalmoplegia.
Parkinson's Disease	Stiffness and slowness of motion. Tremor at rest. Gait is shuffling and composed of small steps, occasionally festinating.	Rare in idiopathic type. In postencephalitic type oculogyric crisis, pupillary and accommodative changes, lid tremor.
Wilson's Disease	Rigidity and coarse tremor. Contractures and asymmetric flexor postures.	Kayser-Fleischer corneal ring. May be scleral icterus.
Amaurotic Family Idiocy	Eventual quadriplegia. (Fatal in 2-3 years)	Cherry red spot at macula. Optic atrophy. Complete blindness.
Friedereichs Ataxia	Inability to run, violent ataxia unaffected by eye closure. Marked weakness and hypotonia.	Nystagmus. Optic atrophy, pupillary changes and ophthalmoplegia occur on rare occasions.

referred to as the dangerous triangle. The danger lies in the fact that this region is drained by the ophthalmic (emissary) veins and hence infections here may readily lead to involvement of cranial venous sinuses, a complication with grave, often fatal, results. Although not as serious since the advent of antibiotics, infections of this region must never be treated lightly.

The remarkable mobility of the face is due to numerous small ("mimetic") muscles which insert directly into the skin, make possible the great variety of facial expressions and have probably been cursed by anatomy students trying to dissect them out since time immemorial. All of these muscles (with the exception of those subserving mastication) are innervated by the seventh cranial nerve. Affections of the central or

TABLE IV

SOME OCULAR IMPLICATIONS OF DISEASES PRODUCING CHARACTERISTIC FACIES

Renal Disease. Face is pale, puffy, especially around eyelids. There may be generalized edema. Uremic frost in advanced cases; lidedema; hypertensive retinopathy; exudates; edema and hemorrhages.

Thyrotoxicosis. Face has a frightened or staring appearance. Perspiration is increased. A goiter may be visible. Exophthalmos; lid retraction; ophthalmoplegia; remote near point of convergence.

Liver Disease. The eyes are sunken and musculature may be atrophic. Complexion is sallow. May be spider angiomas. Scleral and conjunctival jaundice; Kayser-Fleischer ring in Wilson's disease.

Facial Paralysis. Affected side immobile; smooth with less prominent wrinkles. Drooping of corners of eye and mouth. The outstanding feature is asymmetry. Epiphoria; conjunctivitis; lagophthalmos; keratitis sicca.

Acromegaly. The features are large and course. The supraorbital ridges, malar angles and lower jaw are massive and protruding. May be visual field defects, e.g., bitemporal hemianopsia.

Congenital Syphilis. Saddle nose; frontal bosses, rhagades and notched teeth. 8th nerve deafness. Rhinitis in infants. Interstitial keratitis; chorioretinitis; pale disc; conjunctivitis in early childhood.

Disseminated Lupus Erythematosus. Butterfly shaped sharply outlined red lesion over nose and cheeks. Chiefly involves women in adult life. Cotton wool exudates; hemorrhages and papilledema. Cytoid bodies.

Parkinson's Disease. Unnatural immobility of facial musculature. Speech may be slurred and monotonous. Emotional facial expression slow to develop and diminish. Widened palpebral apertures; blinking is infrequent; lack of spontaneous ocular movements. Diminished convergence. Lid tremor.

Sturge-Weber Disease. Vascular nevi on face, usually bilateral, along distribution of trigeminal nerve. Chronic simple glaucoma; retinal vascular anomalies; choroidal angioma.

Tuberous Sclerosis. Yellow-brown to red hard nodules distributed along the nasolabial folds and spreading across cheeks. Mental and neurological symptoms. Grayish-white fundus tumors.

Von Recklinghausen's Disease. Cafe au lait pigmentation; multiple soft sessile tumors. Fundus tumors similar to those of tuberous sclerosis. Signs and symptoms of nerve tumors.

Osler-Weber Disease. Telangiectases of face and mucous membranes with tendency to frequent nose-bleeds. Vascular malformations of fundus vessels and vitreous hemorrhages.

peripheral course of this nerve may therefore result in paralysis, palsy or spasticity.

THE SKIN

The body is covered by skin (integument). It is a first line of defense against trauma and infection, a water and heat regulating organ and a storage place. Through its sensitive nerve endings, it provides us with information about our immediate environment. It blushes in modesty, pales in fright and contracts in horror. Also it is readily available for observation.

The layman speaks of a "healthy looking skin" and recognizes intuitively that many systemic as well as local diseases have dermatologic consequences.

The elasticity (decreased in old age), turgor (increased in edema and diminished in dehydration), color (erythema, jaundice, carotenemia, cyanosis, pallor, etc.) and temperature (fever, local inflammation and vasomotor disturbances) are usually readily apparent. The texture is influenced by age, disease, sex and environment. Scars give evidence of past injury (traumatic, surgical, chemical or bacteriologic). Eruptions (macules, papules, vesicles, pustules) accompany a variety of infectious, allergic and vasomotor disturbances. They may lead to scaling, crusting, excoriation, weeping, ulceration, pigmentation, lichenification and scarring. Swellings or lumps may be noted. These may be inflammatory, congenital, structural or neoplastic. Since roughly 20% of all cancer involves the skin prompt medical referral should be the rule especially if a swelling is noted to grow larger, ulcerate, refuse to heal or is persistently painful. The optometrist's role in cancer detection is one of help to medicine. He should be familiar with these danger signals.*

*Part three of this report, "Hands, Circulation, Nervous and Musculoskeletal Systems," will appear in the April Issue.

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VISUAL PROBLEMS IN INDUSTRY — PART III*

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VII. MECHANISMS FOR FOCUSING A CLEAR IMAGE UPON THE RETINA.

(A) THE NEED FOR CORRECTIVE LENSES.

Although clear vision may be more essential in some jobs than in others it is a rare job in which clear vision does not constitute a distinct asset. We think of a person as having normal vision if, with relaxed accommodation, he can see distant objects clearly, and if by using accommodation he can see clearly objects close at hand. In providing a pair of corrective lenses for a worker the primary objective of correction lenses is to make possible seeing distant objects clearly with relaxed accommodation. A younger person with an ample range of accommodation can see near objects clearly through the same pair of lenses that are used to correct his vision at distance. As a person gets older his range of accommodation becomes shorter and shorter and eventually it will be necessary for him to use a different correction for near as compared with distance. Although a worker can with effort see clearly as long as his work lies at a greater distance from his eyes than his near point of accommodation, in general he will not be able to do this with comfort unless his work lies at least twice as far away from him as his near point of accommodation. A younger person who has an abnormally low amplitude for his age or who has some anomalous relationship between accommodation and convergence may also have to have a different correction for near work as compared with work requiring distance vision. It is usually possible to incorporate both of these corrections into a single pair of spectacles in the form of bifocals.

(B) RELATION OF REFRACTIVE ERRORS TO PERFORMANCE.

Although optometrists and ophthalmologists generally are fully cognizant of the importance of refractive errors, steps have not yet been taken to demonstrate in an adequate way the importance of refractive errors as such to industry. About all we can point to are the studies[30] in which performance in industry has been related to visual acuity. These studies are inadequate for investigating the relation between

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refractive errors and performance for several reasons:

(1) Refractive errors can affect performance in different ways than by blurring vision.

(2) Only a certain number of the different types of refractive error will produce blurred vision.

(3) This approach to the problem provides us with no means of evaluating the separate effects of myopia, hyperopia, astigmatism and anisometropia.

It might be supposed that a direct study could be carried out in industry to determine the relationship between refractive errors and performance. However, since all of the factors cannot be controlled, the other factors in the situation would to a large extent mask the effect of refractive errors. It is my opinion that the only satisfactory way to investigate this phase of the problem is to do a controlled experiment in which we artificially produce refractive errors of different types and degrees in the same individuals.

On purely logical grounds, one can expect in distance vision that the sharpness of vision will be impaired by myopia and astigmatism and that anisometropia will impair three-dimensional vision.

All of these conditions can be artificially created in normal eyes by the use of lenses.

At the near point, myopia does not present a problem unless it is excessive and as a matter of fact in some situations it may be an asset. The two principal refractive errors that we have to pay attention to at the near point are astigmatism and anisometropia. The effect of astigmatism is different at the near point as compared to distance because the worker can usually accommodate so as to reduce his blur to a minimum and he usually ends up with the same type of blur which would be produced by throwing out of focus an eye which is free from astigmatism. It is possible, therefore, to simulate the condition of astigmatism at the near point by the use of crossed cylinders with the axes at 45° and 135° respectively. This technique has already been used successfully in two separate studies[31, 32] and promises to be of considerable use in evaluating the effect of blurred vision at the near point upon performance.

Although not classified as a refractive error, presbyopia eventually produces blurred vision when a person can no longer accommodate for near objects. The type of blurred vision encountered is exactly the same as that encountered with crossed cylinders, and hence the crossed cylinder technique can be used to study the effect of blur from presbyopia as well as the blur from astigmatism. When uncorrected astigmatism

and presbyopia are combined in the same individual, it is not easy to simulate this condition.

Anisometropia causes a different kind of trouble in near point work. In exactly the same way as at distance, it impairs three-dimensional vision and leads to the suppression of vision in one eye. This condition can be simulated in the case of a normal pair of eyes by the simple device of putting a plus sphere over the one eye and minus sphere over the other.

The reason why progress has been so slow in understanding the relation of refractive errors to performance in industry, is that we have always attempted to take a short cut by measuring visual acuity, and on the basis of this sort of finding we either juggle workers from job to job in accordance with the visual acuity requirements of the job or else refer those with impaired visual acuity for professional eye care to determine whether anything can be done by way of spectacles or vision training or other forms of eye care to restore vision to normal. This program is working with a reasonable degree of satisfaction, but as long as we have to work in terms of the relation between visual acuity and job performance without tracing the source of impaired acuity to this or that type of refractive error we cannot hope to deal with these problems with a great deal of understanding.

One of the unfortunate things about this approach is that a worker will get no attention unless he has a refractive error that impairs acuity. It leaves untouched the refractive errors which do not impair visual acuity and performance directly, but which impair performance in other ways and/or may be a source of discomfort and actual permanent injury to the worker. We should not criticize ourselves too severely, however, because the measurement of refractive errors of workers in industry in connection with a screening program would be very costly if we had to use the methods now available which would require highly trained personnel. The thing that we need to aim at is the development of screening tests which will pick up refractive errors other than myopia and astigmatism and which will select those persons who need a correction for refractive errors irrespective of the immediate effect of such a correction on the performance of a given job.

(C) PUPIL SIZE AND BLURREDNESS.

In discussing the factors which affect blurredness of the retinal image, we cannot afford to overlook the role played by the pupil of the eye. One can partly compensate for an error of refraction or inability to accommodate by admitting a lot of light into his eyes. The light constricts the pupil and increases the depth of the focus of the eye. By

cut and try methods many workers discover that a bright source placed directly in the field of view will improve the visibility of objects that they are trying to see, and they will tolerate the discomfort produced by this glare source to get the improved vision. Instead of using a concentrated glare source however, one can use an illuminated surround and still keep the brightness at all parts of the field below the discomfort level.

VIII. OPTICAL AIDS OTHER THAN CORRECTIVE LENSES.

There are many jobs which require optical devices such as mirrors, prisms, filters and magnifiers. This constitutes a special type of problem which we shall not discuss here.

IX. FIXATION AND CONVERGENCE.

One who pays attention to how he sees will be aware of the fact that he can look first in one direction and then another and that when he looks in one direction, objects in another direction are not seen clearly. Most jobs require or permit the eyes to move about a great deal. By studying the basic principles underlying these eye movements, one can more effectively design a display of visual information such as a printed page or a display of instruments on the instrument panel of a cockpit.

For most jobs the two eyes are used simultaneously. It is important therefore to keep the two eyes not only focused at the same distance (free from anisometropia) but also pointing toward the same object. We use the word phoria to designate tendency for one eye under a cover to deviate away from the object the other eye is looking at. A measure of this phoria or deviation under cover may be taken as an indirect measure of the difficulty the worker will have in using the two eyes together: that is, keeping them pointed in the same direction. When he attempts to use the two eyes simultaneously a person with a high phoria is apt to show some difficulty in getting his eyes to converge exactly on a common point. This failure to converge on a common point is referred to as fixation disparity. This may result in poor three-dimensional vision or it may lead to suppression of vision in one eye.

The effect of phoria upon performance at a given job can be evaluated to some extent by allowing persons with normal vision to perform the job while wearing prisms of various powers.[31] One of the ways in which prisms will impair vision is through the impairment of three dimensional vision. This can be demonstrated by measuring the threshold of stereopsis through prisms of various powers.[33]

If the phoria is excessive or if the prisms which are worn exceed a certain value the eyes not only have difficulty converging on a target but

may actually see the target blurred. A person who is suffering from this sort of difficulty can be helped sometimes by a program of vision training or by wearing a pair of lenses or prisms which will bring his accommodation and convergence into a harmonious relationship.

Industry sometimes presents a special problem in that a worker may have to look at objects at a short distance in front of the eyes and in this case it may be necessary to design special prismatic lenses which will permit the eyes to function with the near point objects as if they were located at a considerable distance from the eyes. An ordinary large magnifier through which an object can be viewed with the two eyes is a good example of this sort of device.

X. MECHANISMS FOR RECORDING IMPRESSIONS IN THE RETINA AND TRANSMITTING THEM TO THE BRAIN.

It is obvious that this part of the visual mechanism must be functioning as it should in order for a person to see efficiently. Unfortunately the impairments suffered by this part of the visual mechanism are more or less permanent and are produced either by diseases of the eye or represent congenital anomalies. Effects of such impairments upon performance in industry constitute a separate topic which I shall not discuss. It is needless to say that the rehabilitation of such people including the totally blind constitutes a major problem for industry and society.

XI. INTERPRETATION OF RETINAL IMPRESSIONS ARRIVING AT THE BRAIN.

I shall not attempt to discuss in this paper the perceptual skills of a worker which are used in the interpretation of impressions after they arrive at the brain and the relation of these skills to performance in industry.

XII. SEEING WITH COMFORT.

As pointed out earlier, the first aim in helping a man become visually adapted to his job is to enable him to perform his job efficiently. The second aim is to enable him to do it with comfort. The reason for putting efficiency before comfort is not so much that efficiency is more important but rather that the requirements for efficiency are more stringent than the requirements for comfort and if one can get things adjusted for efficiency only minor modifications will be necessary in order to render the situation comfortable. There are many things which contribute toward making a satisfied worker and there is no need to minimize any of them. His pay, his sense of importance and achievement and his happy relations with fellow workers are sources of good feeling which can keep latent sources of discomfort from occupying his

attention. On the other hand we can identify genuine experiences of discomfort arising from the use of the eyes which can contribute to the general dissatisfaction of the worker.

One form of visual discomfort is associated with what we call eyestrain. The various objective symptoms of eyestrain include such things as redness of the eyelids, photophobia, tearing, tics, blinks, etc. The subjective symptoms include sharp and dull pains in and about the eyes, sandy, gritty feelings, burning sensations, and aches and pains located at various parts of the head. Most of these symptoms of eyestrain are associated with the motor adjustments of the eye, fixation, accommodation and convergence and contraction and dilation of the pupil. The investigation of the sources of discomfort associated with the use of the eyes is fraught with all sorts of difficulty. One of the big problems is that many of these feelings of discomfort represent referred pains so that introspective methods prove quite misleading as to the source of the difficulty. Another problem is that an attempt to accommodate or converge results not only in contraction of the muscles required to make the eye change focus or turn inward but in each instance the excitation will spread to a group of so-called auxiliary muscles which include the frontalis muscle, the corrugator supercilii and the obicularis muscles. These are the muscles which wrinkle the eyebrows and give the worker a strained look.

Pain or discomfort resulting from the use of the eyes has been the subject of several intensive studies in recent years. A good example of concentrated study of this problem is illustrated by the attention that illuminating engineers are paying to the effect of distribution of brightness in the field of view upon comfort. Several empirical methods[4] have been worked out in recent years for predicting whether a given lighting installation will result in a comfortable environment for a worker. For example, if we had the simple situation of one light source in a room which is used for doing a job and if the light source were not shielded from the view of the worker, one could determine from the information available whether or not the average worker would experience discomfort from such a glare source. However, a worker is usually placed in a complex environment involving a number of different glare sources. No completely satisfactory principle has yet been evolved which can be used for evaluating ahead of time the combined effect of a number of glare sources.

It has long been suspected that the discomfort produced by poor lighting installations can be attributed to the contraction of the sphincter muscle of the iris, which in turn stimulates nerve endings of the fifth

nerve which produce the discomfort. Lebensohn[34] is one of the modern exponents of this theory. Fugate and Fry[35] have recently undertaken a new study along this line, and have verified what has been found previously: namely, that the discomfort produced by a flash of light from an ordinary light source can be abolished through the use of homatropine. It is necessary in this sort of experiment to paralyze the irides of both eyes because when one iris is paralyzed stimulation of that eye can still produce discomfort by virtue of the consensual contraction of the pupil in the opposite eye. These investigators have shown that the threshold of discomfort is not dependent upon a change in pupil size of a given amount, because the amount of pupil constriction necessary to produce discomfort is a function of the distribution of light in the field of view. Although a change in pupil size might be a good index of whether or not the individual does or does not experience discomfort, it is apparently necessary to pay some attention to the distribution of light in the field of view in order to make a precise prediction. Therefore, we still do not know how to predict the effect on comfort of a combination of a number of light sources in the field of view. Additional study will be necessary both to determine the basic principles involved and also to accumulate the necessary data to make a precise prediction.

The work to date has been confined more or less to flashes of light. This needs to be extended to include responses to the steady exposure of light sources. Although paralysis with homatropine eliminates the discomfort associated with flashes of light from ordinary light sources, a person with his irides paralyzed with homatropine encounters a different type of discomfort when he is made to go out into the open and face the sky. Even though the irides are not capable of responding at all under these circumstances and the pupils are fully dilated, a considerable amount of discomfort is encountered. Introspectively it appears to be different from the discomfort encountered at lower brightnesses when the sphincter muscles are still active. The discomfort appears to be more of the order of a feeling of tension or tendency to squint. At these levels there also occurs an irrepressible desire to blink and eventually tears appear.

Investigations of this type offer a great deal of promise that the art of elimination of sources of ocular discomfort may be reduced to an exact science. Even now illuminating engineers can resort to cut and try methods to eliminate discomfort in most situations and there is little excuse any longer for making workers in industry put up with visual discomfort from poor lighting.

Visual discomfort of the same type and all of the other symptoms of eyestrain, occur when refractive errors, and anomalies of accommodation, fixation and convergence are not corrected. In this case ophthalmologists and optometrists can usually find some way of making the worker comfortable.

Investigators[36] who concern themselves with visual fatigue recognize a second form of visual discomfort which can be designated as frustration from not being able to see what one is trying to see. This is a form of irritation which can build up during the day.

XII. VISUAL FATIGUE.

Visual fatigue may be measured in terms of impaired performance during a period of work, an increase of symptoms of eyestrain, an increase in frustration and irritability, and a general increase in the feeling of tiredness as well as a specific feeling of tiredness of the eyes. A certain amount of visual fatigue is inescapable in performing any task requiring the use of the eyes. When an undue amount is encountered, the cause should be investigated.

XIII. PERMANENT IMPAIRMENT OF VISION AND HEALTH.

In industry, workers are subject to many accidents that result in injury to the eye but we are concerned at the moment only with impairments of the eyes and health which are produced by improper use of the eyes. Although there are many specific instances in which improper use of the eyes could be cited as the cause of some permanent impairment of vision such as amblyopia, nystagmus, detached retina, etc., or the cause of such conditions as nausea, ulcers and torticollis, which involve general health, these are relatively rare. If industry undertakes to provide adequate lighting for comfort and freedom from visual fatigue, and also adequate professional eyecare, it will have done all it can to prevent permanent impairment to health and vision by improper use of the eyes.

SEEING WITH SAFETY

The requirements for safety are in general much lower than the requirements for efficiency and for comfort. In designing a given environment for safety the visual precautions we take in the interest of safety are primarily those of illuminating the spots where hazards occur or clearly marking them with paint.

In the case of some persons disease or injury to the eyes or congenital anomalies have taken their toll so that the vision is considerably below normal. Such persons cannot safely perform some tasks. Industry is obligated to note the existence of such defects among its workers and to make allowances in assigning these people to jobs.

Seeing with safety has been discussed above from the point of view of using the eyes to avoid hazards to any part of the body or to fellow workers. This should not be confused with the problem of protecting the eyes of a worker from harmful radiation or chemicals or flying objects.*

*Part I of this report appeared in the January issue. Part II in the February issue.

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AMERICAN ACADEMY OF OPTOMETRY

NEW MEMBERS

The following optometrists have been elected to Fellowship in the American Academy of Optometry. The Executive Council welcomes these new members.

Mr. C. S. Flick, 19, Chilworth Mews, London, England.

Dr. Julio Moros Guerrero, Avenida Mexico 207, Este 4, Caracas, Venezuela.

Dr. George G. Howe, 921 Maple St., Duncan, Oklahoma.

Dr. Walter H. Johnson, 44 Bank St., St. Albans, Vermont.

Dr. James F. Koetting, 202 McNulty Bldg., 3209 Brown Road, St. Louis County, Missouri.

Dr. Morton J. Schomer, 5151 Warrensville Center Road, Maple Heights, Ohio.

Lt. Joseph L. Sharick, Eye Clinic, 3431 SU USA Hospital, Ft. Jackson, South Carolina.

Mr. James Albert Simmonds, 4, Abbey St., Crewkerne, Somerset, England.

Dr. Herbert D. Woolf, Garfield Heights Medical Center Bldg., 9710 Garfield Blvd., Garfield Heights, Ohio.

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ERNEST H. KIEKENAPP RETIRES

Dr. Ernest H. Kiekenapp, 68, Minneapolis, has announced his retirement as secretary of the American Optometric Association in June of this year. This move will bring to a close 35 years of service to his profession during which time he has done more than any other individual in developing the programs of the A.O.A.

Ernest Kiekenapp was elected secretary of the A.O.A. in June, 1922, at Indianapolis. He started the JOURNAL OF THE AMERICAN OPTOMETRIC ASSOCIATION in 1929 and has been its editor since that time. During this entire period he has faithfully and for some periods, almost single handed, carried on the activities of the A.O.A.

In 1936 his job was made full-time and he moved from Faribault, Minnesota, where he had been in part-time practice, to Minneapolis, where he established the A.O.A. headquarters. This office in the Wilmac building will officially close during the coming summer and all A.O.A. activities will be centered at the new St. Louis main office.

Ernest Kiekenapp was born in Faribault, May 13, 1889. He received his O.D. degree at the Stone School of Optometry, St. Paul. In 1917 he married Edna Kingsley. They have one daughter Audrey, now Mrs. Kiki Gray of Houston. He became a member of the American Academy of Optometry in 1929. He received the Gold Medal Award of the Beta Sigma Kappa in 1950.

Throughout his long career Dr. Kiekenapp served not only the A.O.A. but was active in the work of his state optometric association and his state board of examiners in optometry. In all of his activities, the welfare of the profession came first, and through his many efforts much of the progress of the profession may be traced.

Now, in the early evening of his life he is turning over the work he has so long cherished to a group of professional administrators. In going into retirement he takes with him the very best wishes of colleagues from coast-to-coast who have grown to love him for his constant work in behalf of optometry; for his never failing good humor and for his high ideals which typified every aspect of his work.

To you, Ernest, we of the Academy wish you the very best in the years ahead and we look forward to a continuation of our associations in the years to come. For your work with the A.O.A. we can only join the entire profession in saying "well-done" and offer you our heartfelt thanks.

CAREL C. KOCH

DISPENSING A PART OF OPTOMETRY

If the spectacle frame holding a pair of 5.00 D. concave or convex lenses is slightly tilted so that the center of one lens is, let us say, 2 mm. below that of the other, 1.00Δ vertical difference is induced. Because of the limited extent of vertical fusion movements, vertical phorias of this magnitude frequently require correction. Therefore, it is obvious that the higher powered lens prescriptions must be accurately aligned. One method for aligning lenses accurately consists of dotting the centers of the lenses in India ink and using these reference points in adjusting the spectacles. The present paper describes another and, we believe, more satisfactory method.

The patient, seated in the ophthalmic chair and wearing his spectacles, is instructed to look at a muscle light at the end of the room. A Maddox rod, mounted in a paddle-shaped handle, is held in front of the spectacles and is oriented to present a horizontal streak to the patient. The spectacles are tilted first one way and then the other (much as a teeter with the nose as a fulcrum) while the patient reports the relative

location of the spot and the line. The glasses are now adjusted so that the streak passes directly through the spot of light. The technique is used at the time the spectacles are first adjusted, at the time of the progress report, and at any subsequent visits for readjustment of the spectacles.

Clearly, the technique consists of nothing more than repeating the vertical phoria measurement through the patient's prescription lenses by the Maddox rod technique. That so simple a concept should merit discussion may seem preposterous. Yet, the technique is not generally used and has certain merits which may be summarized as follows:

1. The obvious benefit is that this technique enables the patient's spectacles to be adjusted in such a way as to create a condition of vertical orthophoria.

2. The patient is aware that his spectacles are adjusted "on the beam." This serves to emphasize to him the importance of wearing his spectacles perfectly aligned.

3. Perhaps of most importance is the fact that this technique emphasizes the inseparability of refraction and dispensing. The concept of using optometric testing procedures in the aligning of spectacles is not original with the present author. Many years ago Copeland advocated adjusting spectacles whose lenses have a high cylindrical component by using the streak retinoscope and a technique which he called "straddling." Copeland has demonstrated that by this means it is possible to adjust a 1.00 D. cylinder so that it is worn with its axis within one or two degrees of the proper position. The techniques of Copeland and of the one here described demonstrate that only a person equipped to examine eyes can perfectly align a pair of spectacles. Consideration of these techniques makes it clear that the dispensing of spectacles is not a separate field from the visual examination, but rather is part of the same service. The patient who wears lenses with a moderately high spherical or cylindrical component is best served if these spectacles can be fitted by one who can recheck certain visual aspects through the spectacles and makes certain that the lenses are adjusted to obtain the desired results. Undoubtedly there will occur to the reader other clinical tests which may be utilized as aids in dispensing and adjusting spectacles.* Cataract lenses, for example, are best fitted with the patient reporting the effect of slight changes in lens positioning following his observation of the Snellen chart.

The technique here described and the others which have been

*For example, the Turville infinity balance technique could be used to balance the vertical vergences just as effectively as the Maddox rod technique here described.

mentioned have certain clinical value. More important, however, is the fact that they reemphasize the concept of optometry as a complete visual service. The dispensing of spectacles is not a field separate from optometry but is, in fact, an integral part of optometry. The dispensing of spectacles is best carried out by one who understands what it is that the spectacles are designed to achieve and one who can clinically determine if the spectacles are actually achieving this desired end.

MONROE J. HIRSCH

ACADEMY LUNCHEON AT A.O.A. CONGRESS

Plans are now being made for an Academy luncheon to be held in Los Angeles during the coming Congress of the American Optometric Association in June. It is the hope of the Executive Council that all Academy members attending the Congress will arrange to attend this luncheon for an informal reception for newly elected president Dr. Robert W. Tubesing and a general get-together. The time and place for this luncheon will be announced in the near future.

TERRY JUDITH PARKINS

NEW EYE CHART BY BETTER VISION INSTITUTE

Along a number of fronts the Better Vision Institute is doing a splendid job and this fact is again brought to mind in reviewing the distribution of their new full color promotional eye chart which is to be used in school vision programs and can also be used as a background for talks on vision before small lay groups. This colored lithographed chart, 40″ high and 60″ wide, on heavy stock is suitable for hanging on a wall. It is designed to tell the story of vision and highlight ocular functions. It does this beautifully. For teachers, the chart is accompanied by a 20 page manual of supplementary information for general study of the subject by the class. This chart is useful for a number of purposes and optometrists are urged to purchase these in quantity for school and other distribution. The combined cost of chart and manual is $1.00 and orders with check should be sent to the Better Vision Institute, 630 Fifth Ave., New York 20, N. Y.

RUDOLPH EHRENBERG

SPECIAL REPORT

THE DIVISION OF LABOR BETWEEN OPTOMETRY AND OPHTHALMOLOGY*

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PREFACE

This paper and the sequel[1] which follows have been written to express my own personal opinions on how optometry, ophthalmology and opticianry ought to be interrelated in the field of eyecare.

ROLE OF OPHTHALMOLOGIST IN TREATMENT OF EYE DISEASES

It goes without saying that since the optometrist does not treat diseases of the eye, he must recognize the indispensability of the ophthalmologist in the field of eyecare. In planning his own future, therefore, the optometrist must formulate some conception of the division of labor between himself and the ophthalmologist who treats diseases of the eye.

LINE WHICH LIMITS PRACTICE OF OPTOMETRY

The first basic assumption which might be made is that the line between medicine and optometry for any foreseeable future will continue to be drawn at the use of drugs. It is true that prominent members of the medical profession as well as many optometrists have recommended that the optometrist ought to be encouraged to use drugs for the purpose of examining eyes and specifically they have advocated the use of drugs to anesthetize the cornea, dilate the pupil, and relax accommodation. As a matter of fact the ophthalmic opticians of Great Britain who represent the counterpart of optometrists in this country do actually use such drugs, and do so without abusing the privilege. Whether therefore optometrists should use drugs is not a matter of whether it is technically feasible: we already have an example of this feasibility. It is a matter of whether the technical advantages

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†Optometrist, Ph.D., Director of School, Fellow, American Academy of Optometry.

[1]Glenn A. Fry. Interprofessional Relations in the Design and Fitting of Eyewear. To be published in the April, 1957, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

outweight the advantages of our present system in maintaining professional standards and interprofessional relations.

The use of drugs makes a convenient line to draw between the practice of optometry and the practice of medicine for the purpose of licensing optometrists and defining standards for the practice of optometry and for interprofessional relations.

SUCCESSFUL SURMOUNTING OF HANDICAPS IMPOSED BY RESTRICTION

In the past those who have been unsympathetic to optometry have claimed that the optometrist cannot properly examine eyes for fitting spectacles without the use of drugs and that he cannot properly inspect the lens, vitreous, retina and choroid for eye disease. The optometrists have developed special methods for achieving the desired results without the use of drugs and the restriction no longer constitutes a serious barrier to the public acceptance of optometry.

If optometrists really felt that drugs were necessary for ascertaining the refractive status of the eyes or inspecting for pathology, they could seek permission through the legislatures to use such drugs. This at lease would stop the argument, but it is my opinion that more is to be gained by drawing the line at the use of drugs.

PROVISION OF EYECARE FOR SMALL ISOLATED COMMUNITIES

There is also the argument that the optometrist ought to be transformed into a kind of practitioner between the optometrist and the ophthalmologist and that he ought to be permitted to use minor drugs and surgery, in order to make medical eye care more widely available. The heart of this argument is that a fully trained ophthalmologist is likely to set up his practice in a large city where he will be a long distance from many who need emergency eye care. Emergency and minor eye care could be handled by a less trained person practicing nearby. This is one of the socio-economic problems which has yet to be solved. What is needed first is a thorough study of how well these needs are being met. Until the facts prove it to be otherwise, the best assumption that can be made is that the needs can be met without changing the restrictions which are now in force.

NUMBER OF OPHTHALMOLOGISTS NEEDED

It is my opinion that every ophthalmologist ought to be an expert refractionist and must do enough refractions to keep himself proficient, but beyond this, refractions should be left to optometrists.

The basic argument is simply that it is a waste of expensive training for an ophthalmologist to spend a large part of his time refracting eyes.

PREVENTION OF BLINDNESS

Everyone wants to prevent blindness and wants to see an adequate program in operation.

Compulsory periodic eye examinations could be imposed upon each person for the purpose of detecting the need for medical eye care but such a program would be hard to justify. We have resigned ourselves to wait until people voluntarily present themselves for eye examinations.

Many people come to the ophthalmologist or general practitioner or optometrist because they believe they have something medically wrong with their eyes. Many a person, however, comes to the optometrist or ophthalmologist with the conviction that his eyes do not need a medical check-up, but merely wants his eyes examined for spectacles. When such a person comes to the ophthalmologist with nothing more in mind than to be examined for spectacles the ophthalmologist believes he must include in such an examination a check-up on the need for medical eye care.

On the other hand when the patient comes to an optometrist, some ophthalmologists are not happy to have the optometrist attempt to pass judgment on a patient's need for medical eye care and much prefer to have the optometrist tell the patient that he does not give advice on medical eye care so that the patient will not be lulled into a false sense of security.

Some ophthalmologists argue that every patient who wants to be examined by an optometrist should be required to be examined first by an ophthalmologist for eye disease: but the public is not likely to submit to such a program.

Optometrists have come to recognize the contribution that they can make to the prevention of blindness by checking each of their patients for eye pathology and referring them for medical treatment when needed, and are making every effort to better themselves to render this service. They are willing to accept whatever training and guidance ophthalmologists give them in detecting diseases of the eye and setting up criteria for referral.

MORAL AND LEGAL RESPONSIBILITIES OF THE OPTOMETRIST

It is inevitable under the present scheme of things that a large fraction of the public will come to an optometrist whenever they need eye care of any kind, and the optometrist must be prepared to assume the moral responsibility for screening his patients for eye pathology. This applies to those who come to him expressly for having their eyes examined for spectacles, as well as to those who come because they suspect that they may have some eye disease and are willing to rely upon the optometrist to determine whether they need to be referred to an ophthalmologist.

An optometrist's responsibility in this connection is not properly defined in many of the state laws of optometry. In some states he is prohibited from claiming that he is qualified to diagnose diseases and thus is not legally accountable for his failure to have detected a disease which may have led to blindness. In other states he is required to perform specific tests for ocular pathology.

The laws ought to make an optometrist legally accountable for the consequences of his failure to refer a patient for medical care when he should have been referred. As in the case of a medical practitioner, the optometrist is likely to make a mistake now and then, but at least he should be legally accountable for exercising reasonable care.

In order for the optometrist to merit the confidence of the medical profession as screeners of patients he must impose upon himself the legal as well as the moral responsibility for inspecting the eyes of his patients for pathology and referring them when necessary.

ARTIFICIALITY OF DEMAND FOR OPHTHALMOLOGISTS TO DO REFRACTIONS

If a person of his own free will prefers to go to an ophthalmologist instead of an optometrist this is his American privilege regardless of his reason for doing so. But we can avoid creating an artificial demand for having one's eyes examined only by an ophthalmologist and help relieve him of such demands upon his time. Two sources of artificial demand are the referrals made by dispensing opticians and general practictioners of medicine. The problems that arise in connection with dispensing opticians have been discussed elsewhere.[1]

More general practitioners will have to be persuaded to accept the optometrist as qualified to do an expert job at refraction and to detect eye diseases. He must also know that the optometrist is willing to refer patients when this is needed.

Nurses and others who are ancillary to the practice of medicine also contribute in the same way as the general practitioner to the artificial demand for appointments with ophthalmologists. Optometry must also earn and secure the confidence of more of these people.

MORAL AND LEGAL RIGHT OF AN OPHTHALMOLOGIST TO DO REFRACTIONS

It is often argued that graduates of colleges of medicince who expect to refract eyes should be made to meet the same or equivalent training requirements as graduates of colleges of optometry, and should be required to pass a state board examination in optometry and be licensed by a state board of optometry. To extend this kind of thinking to licensing shows little insight into the overall organization of society. Medical

men are licensed to be responsible for matters of life and death. It is absurd to think that one can impose upon them any more legal responsibility by requiring them to be licensed as optometrists.

Moral responsibility is quite another matter. A graduate from a school of medicine is not expected to engage in a specialty in which he is not trained.

The optometrist has, in my opinion, a moral right to resent having a licensed physician earn his living primarily by refracting eyes, as long as his training in this art is much less extensive than that of the optometrist.

If a person takes advantage of his medical license to earn his living primarily refracting eyes without making a respectable effort to become qualified to practice the art, every means should be brought to bear to make such a man know and feel that he is morally wrong in attempting to supply a service which he is not qualified to supply.

If, however, the ophthalmologist specializes in eye diseases and makes a substantial contribution to the handling of eye diseases in his community, no optometrist can complain about his engaging in refraction, because he must know something about refraction in order to treat eye diseases, and it is necessary to spend part of his time refracting eyes in order to maintain the necessary degree of proficiency.

COOPERATION IN HANDLING PATIENTS

Under the present scheme of things, the optometrist refers patients with ocular pathology to the ophthalmologist, and on the other hand the ophthalmologist may refer a patient to the optometrist for orthoptics or visual training or for the purpose of having the optometrist design and fit a pair of spectacles or to reexamine him for the purpose of fitting contact lenses or optical aids for aniseikonia or subnormal vision. The problems involved in this division of labor have been discussed in a separate paper.[1]

DIVISION OF LABOR IN FIELD OF RESEARCH AND DEVELOPMENT

In the field of research and development it is obvious that those ophthalmologists who are primarily interested in diseases of the eyes must be responsible for research in this field. They must be the experts in such fields as pathology of the eye, the growth, genetics, metabolism and circulation of the eye and the maintenance of intraocular pressure.

The ophthalmologists who are interested in refraction and other non-medical aspects of visual science, should team up with the optome-

[1]Glenn A. Fry. Interprofessional Relations in the Design and Fitting of Eyewear. To be published in the April, 1957, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

trists in building a unified program of research in this area.

The optometric profession through the various committees and departments of the American Optometric Association, the American Academy of Optometry, the American Optometric Foundation, the schools and colleges of optometry and through its journals is gradually building a program of research in the basic field of physiological optics, and in the applied fields such as refraction, orthoptics, contact lenses, subnormal vision, and aniseikonia, and vision in schools and industry.

Several schools of optometry have developed programs of graduate work leading to M.Sc. and Ph.D. degrees in physiological optics. There are many of these ventures in which ophthalmologists are already participating and this should be encouraged.

The Association for Research in Ophthalmology has accepted a number of optometrists into its membership. However, it turns out that the meetings are dominated with papers pertaining to research in pathology and other areas in which the optometrist is little interested from the research point of view.

The optometrists and those ophthalmologists who are interested in the non-medical aspects of visual science can team up with the physicists and psychologists, educators, artists, illuminating engineers, human engineers, and industrial engineers and others in solving the many practical problems of vision.

We find examples of cooperative effort of this type in the Optical Society of America, the Inter-Society Color Council, the Illuminating Engineering Society, and Armed Forces National Research Council Vision Committee and the Highway Research Board among others.

DIVISION OF LABOR IN TRAINING PROGRAMS

Ophthalmologists can contribute a great deal to the undergraduate teaching program of a school of optometry. The ophthalmologists who have served on the staff of the School of Optometry at the Ohio State University have been well versed in pathology of the eye and in addition have been excellent teachers. Such teachers can be replaced by optometrists who hold Ph.D. degrees in Physiological Optics and are serving as teachers in other areas, but it is a great waste of human effort to have these men turn around and become experts in another field in which they are not primarily interested.

It is not that they cannot do it. If they can build a microscope with their own hands, they certainly have sense enough to use it in the study of pathology. But why divert such talents?

On the other side of the picture there exists the possibility that where a school of optometry and a program of training in ophthal-

mology exist side by side, the faculties and facilities of the optometry school might be used in part of the formal training of the interns and residents preparing for the examinations of the American Board of Ophthalmology.

Should optometry and ophthalmology reach a mutual understanding about their objectives in the field of eye care, the optometry schools could help materially in the training of assistants who could work either for optometrists or ophthalmologists.

DIGEST

OPHTHALMIC LITERATURE REVIEW*

G. P. Elmstrom†
El Segundo, California

PREFACE

One of the needs of our profession, which has not been adequately met, is the proper and systematic review of various phases of optometry each and every year. The practitioner requires a simplified but accurate review of recent developments. The Academy, the Optometric Extension Program, and the Schools of Optometry have all moved in this direction but too few are recipients of post graduate studies. The American Medical Association publication, ARCHIVES OF OPHTHALMOLOGY, each year presents reviews covering ophthalmology. During 1956 three reviews were published applying in part or in full to optometry. These three reviews are briefly discussed here.

OPTICS AND VISUAL PHYSIOLOGY review appeared in the June, 1956, issue running 20 pages including some 187 references, covering the year 1955. This is one of the most pertinent reviews of ophthalmic literature which evaluates data of considerable interest to optometry. Such subjects as refraction, myopia, aphakia, contact lenses, aniseikonia, optics, accommodation, vision and traffic safety are briefly presented along with discussions on less clinically applicable phases. Continued study indicates that retinoscopy is superior to the machine-testing of the refractionometer. The Duochrome test, used by many refractionists, has been found to be both precise and quick, and should be applied to patients who can see better than 20/25, whether or not they may be red-green defective. Mediterranean people become presbyopic at approximately 40 years whereas Scandinavians wait until 48. Continued studies would indicate that various techniques to control myopia are very limited. High astigmatism often leads to difficulty for the patient because eyes undergo torsion when looking other than in the primary plane, which the spectacles do not. Contact lenses may offer the opportunity

*Submitted on December 31, 1956, for publication in the March, 1957, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.
†Optometrist.

in such instances to eliminate both the torsion-induced difficulty as well as the aniseikonic problem.

A cylinder placed on the front surface of an aphakic lenses may be too far away from the front of the eye in high or medium degrees of astigmatism, and may be more accurately placed on the rear surface. The field of aniseikonia has been under-emphasized for some time and this fact is emphasized when it is realized that but 53 optometrists and 29 ophthalmologists process space eikonometers in the country as of 1955. One researcher has substituted the orthodox —55.00 Hruby lens used in slit lamps with a +50.00 diopter lens placed near the cornea for equal magnification but a wider field of view when inspecting the retina. Fincham ascertained and confirmed the studies of optometric educators who have maintained that at all ages the amount of accommodation per degree of convergence remained a straight line graph.

NEURO-OPHTHALMOLOGY review appeared in the November, 1956, issue, which covered the period July, 1955-July, 1956. Although this material is considerably more theoretical, such a review does permit the acquisition of proper background data. There are 202 references in the review.

Less attention has been given to the diagnostic value of color fields with more emphasis upon the value and use of size of target and illumination controls in visual field studies. An investigator using 122 patients under 16 years found that intracranial tumors accounted for 70% of eye muscle involvement, an extremely high per cent. Several researchers have found that more than 50% of the patients with cerebral palsy have ocular symptoms, a number with esotropia.

GLAUCOMA review appeared in the December, 1956, issue, containing 58 pages of condensed data on this condition. There are 667 references to the review. The four main topics are: (1) The facility of aqueous flow, (2) The rate of formation of aqueous, (3) Episcleral venous pressure, and (4) Miscellaneous glaucoma topics. The first three sections are reviews of the more technical elements of a glaucoma study, recapitulating the information now accepted as orthodox. The final and main topic as far as optometrists are concerned is unfortunately extremely brief. There are a few statistics presented of interest. Research during the past two years confirm the incident of glaucoma for the general population. Approximately 2% of people over 40 have *undetected* glaucoma, and 4.6% of the people over 64 years. This has led to increased emphasis upon routine use of the tonometer by general practitioners.

CORRESPONDENCE

UNDERGRADUATE CORRESPONDENCE COURSES

To the Editor:

The number of local men in Singapore who are taking correspondence courses and setting up practices as optometrists is really becoming frightening. Unfortunately, these people advertise themselves as qualified optometrists, but from the number of patients I receive who have in the first instance visited these people to obtain a pair of spectacles, I find that the prescribed prescriptions are quite impossible. There is one man specifically who, I believe, will be receiving his diplomas in a very short time. This man has never been out of Singapore in his life and as far as his scholastic attainments are concerned, did not manage to get as far as Junior Cambridge (regret I cannot give you the equivalent in U. S. standards). Holding qualified degrees from America in very high esteem, I cannot understand this present procedure. There is no restriction on setting up a practice in Singapore and calling oneself "qualified," but my objection in this instance is that these people advertise themselves as "Doctors of Optometry" having qualified in America.

I would be very grateful if you could enlighten me on the worth of these correspondence courses, for the holders of these diplomas in Singapore are definitely not safe to be let loose on the public.

KENNETH E. MEYER, F.B.O.A., D. OPT.

6 RAFFLES PLACE,
SINGAPORE, MALAYA.

EDITORIAL COMMENT

Dear Dr. Meyer:

Thank you for your letter of February 15 relative to correspondence courses in optometry. We happen to know of none of these in America, and I am positive that none of these is recognized by any State Board of Examiners in Optometry in any of our 48 states, or in any of the provinces of Canada.

In North America a student must personally attend an accredited institution of higher learning, giving at least a three year residence course in undergraduate professional optometric training before receiving a degree. In some colleges, the course is four years. Before entering these professional schools, the student must be a high school graduate, and also must have satisfactorily completed at least two years of pre-optometric college work in certain specific basic science courses.

If any correspondence courses in optometry are offered in America, these courses are worthless in attempting to become licensed as an optometrist in the United States or Canada, as such a school would not receive accreditation by the authorities.

Any school operating in this manner for overseas students would be regarded as a "diploma-mill" over here, and its diplomas or degrees would have no value whatsoever.

In closing, we would like to suggest that you and a group of your optometric colleagues work with the proper authorities in Singapore to set up a Register of Qualified Optometrists and Ophthalmic Opticians for Singapore and to establish educational standards for the colony which future applicants must meet. This has already

been done in some of the colonies, and just last year in Ireland. This program would eliminate the possibility of untrained persons practising in your area.

CAREL C. KOCH, O.D.
EDITOR

FEBRUARY 21, 1957.

NEED FOR UNDERGRADUATE STUDENTS

To the Editor:

Our big problem right now is getting enough students for our 1957 class. Frankly, I am really worried. I believe that all the schools are having the same difficulty, but I do not know what we are going to do about it. Your recent editorial comment on this problem was very timely. However, it takes a lot of joint persuasion to get mass action on the part of any group. I wonder whether the profession really understands how serious a threat is facing them if we do not have enough graduates to replace the vacancies due to natural causes.

MORTON L. ABRAM, D.O.S.
VICE-PRESIDENT

ILLINOIS COLLEGE OF OPTOMETRY
3241 S. MICHIGAN AVE.
CHICAGO, ILL.

CURRENT COMMENTS

Terry Judith Parkins
Editorial Assistant

Optometrists will confer a favor by sending news items of general interest for this department; such as relate to new instruments, clinical techniques, education, visual health and optometric legislation and organization.

EXTENSION POST-GRADUATE TRAINING IN OPTOMETRY

The Division of Optometry, Indiana University, Bloomington, and the College of Optometry, University of Houston, are offering post-graduate work to groups of optometrists who will meet in some centralized point for instruction by a staff member who travels from the school, to the class, for selected study periods.

At Indiana University, Dr. Neal J. Bailey is now instructing a group of nine optometrists in the basic fundamentals of contact lens theory and practice at Kokomo. At the same time Dr. Merrill J. Allen is instructing a group of 14 optometrists in case analysis at Indianapolis. These 20 hour courses are given over an eight week period, one evening each week.

At the University of Houston the plan is quite similar except that

the courses will be given only during the summer months and the instructor will stay a week in the selected area and complete the post-graduate work within that period, then move on to another area. In Texas the Foundation for Education and Research in Vision is sponsoring these post-graduate courses and for the coming summer the following 12 courses are offered by the faculty.

Course 1, Analytical Analysis of Optometric Data: Course 12, Visual Training, by Dr. Chester H. Pheiffer. Course 2, Aniseikonia: Course 8, Non-Squint Orthoptics: Course 10, Refraction: Course 11, Subnormal Vision and Special Refracting Techniques, by Dr. J. Boyd Eskridge. Course 3, Applications of Ophthalmic Optics, by Dr. Charles R. Stewart. Course 4, Glaucoma: Course 6, Headache: Course 9, Ocular Pathology, by Dr. Theodore P. Grosvenor. Course 5, Graphical Analysis of Optometric Data: Course 7, Modern Clinical Optometry, by Dr. Darrell B. Carter.

This method of bringing the instructors to groups of busy practitioners for post-graduate work is not new in the healing arts professions. Medicine and dentistry have used similar plans with success for years and for that matter the Pennsylvania State College of Optometry has held post-graduate courses of this kind in New Jersey, North Carolina, Michigan and Pennsylvania in the past.

For course descriptions, arrangements and data on costs for either of these series of post-graduate courses, optometrists should write to the Division of Optometry, Indiana University, Bloomington, Indiana, or to the College of Optometry, University of Houston, Houston, Texas.

LECTURES AT OPTICAL FAIR

The educational program now scheduled for the Optical Fair, Palmer House, Chicago, June 7-10, 1957, is as follows:

New and Current Optometric Procedures. Dr. Meredith W. Morgan, Jr., School of Optometry, University of California, and Dr. Henry W. Hofstetter, Division of Optometry, Indiana University.

Subnormal Vision and Its Correction. Dr. Alfred Rosenbloom, Illinois College of Optometry.

Light and Sight on the Job. Dr. Sylvester Guth, Radiant Effects Laboratory, General Electric Company.

Industrial Safety. Dr. Joseph Tiffin, Purdue University.

The Role of Vision in Highway Safety. Dr. Leon Brody, Research Center for Safety Education, New York University.

Lenses for Aphakics. Russell L. Stimson, Los Angeles City College.

Dispensing Style. Pere Westmore, Hollywood.

Professional Economics. Harry L. Wylie, Northwestern University.

Suggestions on Style and Inventory Control. John Roe, Chicago.

The Ophthalmic Market Today. Report by N. W. Ayer & Son, Inc.

A Survey of Visual Problems. Clark Holmes, Committee on Customer Relations, Association of Independent Optical Wholesalers.

There will be no registration fee for attending any or all of these lectures, and all optometrists are invited to come to Chicago and visit

the exhibits, attend the lectures and watch the Style Show. The Optical Manufacturers Association is planning for an attendance of at least 5,000 optometrists from all parts of the U.S.A. and Canada. Route your vacation trip through Chicago in June and come to the Fair.

A.O. COURSES ON ANISEIKONIA AND REFRACTION

A Seminar on Aniseikonia will be given by the staff members of the Bureau of Visual Science, American Optical Company, Southbridge, Massachusetts, April 15-17, 1957. The program will cover interpretation of findings: judgment in prescribing: technique of measurement: case histories: effect of aniseikonia on space perception: significance and clues of the declination of error: etiological factors: methods of translation of findings: iseikonic corrections and the theory of the space eikonometer. The instructors will be Dr. Paul Boeder, director of the Bureau, Dr. Robert E. Bannon, Dr. Salvi S. Grupposo, Paul H. Haynes and Miss E. E. Spooner.

On May 6-8, 1957, the same staff instructors will present a graduate course in Visual Optics and Refraction at Southbridge. This will be their fourth educational conference for optometrists, and some of the topics which will be covered are, magnification in lenses: the role of bifocals in non-presbyopic anomalies: correction of subnormal vision: clinical factors in multifocal lenses: visual problems of school children: visual screening procedures and occupational vision programs.

There will be no charge for participation in either course. Early registration is advisable, since attendance will be limited. Complete details are available from the AO Bureau of Visual Science, Southbridge.

POST-GRADUATE COURSES UNIVERSITY OF HOUSTON

The College of Optometry, University of Houston, has announced a schedule of post-graduate courses for April 26 and 27. Each course is designed to provide detailed instruction on one aspect of clinical optometry, utilizing a combination of lectures, demonstrations, and actual practice.

The six courses offered are (1) Subnormal Vision, Dr. J. Boyd Eskridge: (2) Difficult Refractive Problems, Dr. Darrell B. Carter: (3) The Slit Lamp, Dr. Bernard Mazow: (4) Ocular Pathology, Dr. Theodore P. Grosvenor: (5) Functional Technique of Lens Application, Dr. Chester H. Pheiffer: (6) Developmental Vision, Dr. Jane Brent.

Each course consists of six hours of instruction. A participating optometrist may register in either one or two courses. To be assured of a place in the subjects of first choice, advance registration should be

made. For further information and registration forms write to the College of Optometry, University of Houston, Houston 4, Texas.

CLIPS FOR MEASURING HEIGHT OF BIFOCAL SEGMENTS

Dr. G. P. Elmstrom, El Segundo, California, points out that in the past there have been two extremes in measuring the height of multifocals: one has been the standard of many years, namely, simply measuring the height with a small mm. rule; the other has been the introduction of rather complex devices, often quite expensive. The compromise solution for accurate measurements for this important phase in prescribing lenses is the device by Dr. E. T. Jenison, Maverick Bldg., San Antonio, Texas. Small plastic transparent rules on small clips to be placed directly upon the sample frame which leaves the examiner with free hands for frame adjustment. In pairs, these clips also permit a rapid inspection of hyper-eyes that necessitate different segment height placement. Cost per pair, $3.20 prepaid.

NEWS BRIEFS

Dr. Vernard M. Clarke, Camrose: Dr. James G. Rowand and Dr. Ralph W. LeDrew, Edmonton, have organized the Alberta Chapter, American Academy of Optometry. Their application for a Charter has been approved by the Executive Council and the Charter will be presented to the Chapter at the coming annual meeting of the Academy in Chicago next December. . . . Dr. Chu Chin Wong, Hong Kong, achieved the distinction of being the first undergraduate to complete the six-year program in optometry at the College of Optometry, University of Houston. He is returning to Hong Kong to enter private practice. . . . In an effort to assist in the government sponsored vocational training program for American Indians, Bernard Spero, president of the House of Vision, Chicago, has announced that in the future they will employ as many Indians as possible in their various laboratories. . . . Dr. William Feinbloom, New York City, spoke on the Mirrorscope Lens for the Partially Blind at the February 19 meeting of the New York Academy of Optometry, Midston House, New York City.

More than 600 optometrists attended the annual meeting of the California Optometric Association, San Diego, February 21-24. Dr. Arthur C. Heinsen, San Jose, was elected president; Dr. James R. Gregg, Los Angeles, president-elect; Dr. Douglas McElfresh, San Diego, secretary and Dr. Orestes Righellis, Arvin, treasurer. Dr. George I. Deane, Merced; Dr. John Gorham, Hemet; and Dr. Charles E. Seger, San Luis Obispo, were elected trustees to serve on the board of trustees with the officers. Dr. William L. Harr, Sacramento, was elected president of the California State Board of Examiners in Optometry. . . . The Illinois

Optometric Association has presented the Illinois College of Optometry with a gift of $500.00 for the Building and Development Fund of the College.

William T. Cameron of the Safety Equipment Division, American Optical Company has resigned to manage the newly formed Occupational Vision Council which will develop programs for protection and correction of vision in industry. . . . Dr. William F. Weir, Bloomsburg, Pennsylvania, has announced that Kings College, Wilkes-Barre, and the Eastern Division, Pennsylvania Optometric Association will co-sponsor a School Vision and Reading Conference at Kings College on Sunday, April 28, 1957. Speakers at the conference will be Dr. E. Elona Sochor, Director of Reading Clinic, Temple University; James E. O'Neill, Director of Safety Service, National Society for the Prevention of Blindness; Mrs. Camilla S. Garey, president, Pennsylvania Congress of Parents and Teachers; and Dr. Joseph H. Smith, vice president of the Pennsylvania Optometric Association. The Conference will start at noon and run through 8:00 p. m.

The International Optical League will hold its biannual meeting in Amsterdam, Holland, June 11-15, 1957. The British Chapter, American Academy of Optometry, is a member of the League and the American Academy of Optometry has applied for membership. Academy members who are planning to be in Europe during the summer should write to International Optical Congress Committee, Honthorststraat 12, Amsterdam, Z., Holland, for reservations and other information. A number of technical papers will be presented and special trips for delegates are now being planned. Optometrists and ophthalmic opticians from a large number of countries will attend, and the committee has issued a special invitation to optometrists from the U. S. A. and Canada. . . . Robert L. Phillips has been appointed Director of the Contact Lens Division of the Precision-Cosmet Company, Minneapolis. . . . The Second Annual Eastern Seaboard Conference on Visual Training will be held in Washington, D. C., May 15, at the Ambassador Hotel. Dr. Robert A. Kraskin, 900 F St., N. W., Washington, D. C., is chairman on arrangements and reservations should be sent to his office. . . . The Pennsylvania State College of Optometry has been granted the authority to confer the Bachelor of Science degree by the State Council of Education of the Pennsylvania Department of Public Instruction. The College will award this degree to qualified students in addition to the Doctor of Optometry Degree which the College has been awarding since 1923.

TRANSACTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY

A department devoted to announcements, reports, appointments, organization data, news, professional problems and ideals, as these relate to the Academy.

ACADEMY MONOGRAPHS

One of the popular educational services offered optometrists by the American Academy of Optometry is the publication and distribution of low cost technical monographs. These specially published reprints deal with a great variety of subjects of interest and value to optometrists.

Each monograph is authored by one or more specialists in the selected subject. Not only is this service popular because of its low cost, it is even more appreciated because of the authoritative positions held in optometric practice by those optometrists and educators who have written the extensive material included in this series of now available monographs. This is a continuing service and the profession already recognizes the conservatism and competence of this large body of clinical and scientific writers.

These educational monographs report studies in various fields of optometric practice. This series is unique in its contribution to the *Science of Seeing*, presenting a body of material covering many aspects of the subject. These monographs represent a type of clinical and scientific material which is indispensable to the optometrist, research worker, educator and to the student of visual problems.

More than 200 different titles offer a very wide selection covering most phases of optometric practice. These 6" x 9" monographs vary in length from 8 to 72 printed pages. Each reprint is bound in heavy board covers for permanence.

These monographs will be mailed, postpaid, to professionally interested persons upon receipt of order accompanied by the cost of the reprint or reprints ordered. Payment with orders is essential. Stamps or coins are acceptable on small orders. In ordering monographs selection should be made by number.

The 1957 listing of available monographs follows. This list supersedes prior published lists and only those monographs now catalogued are offered at this time. See pages 165-174.

Orders and checks should be sent to the American Academy of Optometry, 1508 Foshay Tower, Minneapolis 2, Minn.

RUDOLPH EHRENBERG

1957 Catalogue of Academy Monographs

ACCOMMODATION AND CONVERGENCE — TESTS AND IMBALANCES

☐ Monograph No. 150. Merrill J. Allen. An Investigation of the Time Characteristics of Accommodation and Convergence of the Eyes. Historical Review. 8 p. + cover. 25c.

☐ Monograph No. 151. Merrill J. Allen. An Investigation of the Time Characteristics of Accommodation and Convergence of the Eyes. Subjective Determination of Accommodation and Objective Recording of Convergence. 12 p. + cover. 30c.

☐ Monograph No. 82. Merrill J. Allen. An Objective High Speed Photographic Technique for Simultaneously Recording Changes in Accommodation and Con-

☐ Monograph No. 199. Merrill J. Allen. The Influence of Age on the Speed of Accommodation. 8 p. + cover. 25c.
vergence. 12 p. + cover. 30c.

☐ Monograph No. 76. Mathew Alpern. Accommodation and Convergence with Contact Lenses. 12 p. + cover. 30c.

☐ Monograph No. 108. Mathew Alpern. The Zone of Clear Single Vision at the Upper Level of Accommodation and Convergence. 24 p. + cover. 45c.

☐ Monograph No. 173. Robert E. Bannon. Physiological Factors in Multifocal Corrections. 16 p. + cover. 35c.

☐ Monograph No. 141. Robert E. Bannon. Space Perception—Some Physiological Aspects. 16 p. + cover. 35c.

☐ Monograph No. 176. Merton C. Flom. Variations in Convergence and Accommodation Induced by Successive Spherical Lens Additions with Distance Fixation—An Investigation, with the Description of a Clinical Method for Testing the Validity of the Refractive Correction. 28 p. + cover. 50c.

☐ Monograph No. 147. Glenn A. Fry. Research in Accommodation and Convergence. 8 p. + cover. 25c.

☐ Monograph No. 192. Duco Hamasaki, Jin Ong and Elwin Marg. The Amplitude of Accommodation in Presbyopia. 12 p. + cover. 30c.

☐ Monograph No. 204. Gordon G. Heath. Accommodative Responses of Totally Color Blind Observers. 12 p. + cover. 30c.

☐ Monograph No. 205. Gordon G. Heath. The Influence of Visual Acuity on Accommodative Responses of the Eye. 12 p. + cover. 30c.

☐ Monograph No. 34. Monroe J. Hirsch. The Stereoscope as a Method of Measuring Distance Discrimination. 8 p. + cover. 25c.

☐ Monograph No. 55. Henry W. Hofstetter. Accommodative Convergence in Identical Twins. 12 p. + cover. 30c.

☐ Monograph No. 128. Elwin Marg. "Flashes" of Clear Vision and Negative Accommodation with Reference to the Bates Method of Visual Training. 20 p. + cover. 40c.

☐ Monograph No. 102. Meredith W. Morgan, Jr. A Comparison of Clinical Methods of Measuring Accommodative-Convergence. 12 p. + cover. 30c.

☐ Monograph No. 118. Meredith W. Morgan, Jr. Accommodation and Convergence in a Patient with Adie's Pupil. 12 p. + cover. 30c.

☐ Monograph No. 149. Max Schapero and Morton Levy. The Variation of Proximal Convergence with Change in Distance. 16 p. + cover. 35c.

☐ Monograph No. 190. Max Schapero, Frank W. Weymouth and Margaret Hester. The Effect of Fixation Distance and the A.C.A. Ratio on the Angles of Anomaly. 20 p. + cover. 40c.

ANISEIKONIA AND THE EIKONOMETRIC TECHNIQUES

☐ Monograph No. 69. Robert E. Bannon. Aniseikonia and Binocular Vision. 12 p. + cover. 30c.

☐ Monograph No. 1-A. Robert E. Bannon. Heterophoria and Aniseikonia. 12 p. + cover. 30c.

☐ Monograph No. 1-B. Robert E. Bannon. On the Technique of Measuring and Correcting Aniseikonia. 24 p. + cover. 45c.

☐ Monograph No. 144. Robert E. Bannon. Space Eikonometry in Aniseikonia. 16 p. + cover. 35c.

☐ Monograph No. 141. Robert E. Bannon. Space Perception—Some Physiological and Psychological Aspects. 16 p. + cover. 35c.
☐ Monograph No. 103. Robert E. Bannon, F. H. Cooley, Harold M. Fisher and R. T. Textor. The Stigmatoscopy Method of Determining the Binocular Refractive Status. 16 p. + cover. 35c.
☐ Monograph No. 28. Robert E. Bannon and Rudolph T. Textor. Analysis of Successful and Failure Aniseikonic Cases. A Study of the Data in 200 Cases. 16 p. + cover. 35c.
☐ Monograph No. 138. V. J. Ellerbrock. The Effect of Aniseikonia on the Amplitude of Vertical Divergence. 16 p. + cover. 35c.
☐ Monograph No. 66. Harold M. Fisher. A Modification of Space-Eikonometer Technique. 8 p. + cover. 25c.
☐ Monograph No. 172. A. Harry Malin. Testing Aniseikonia with a Simplified Space Eikonometer. 12 p. + cover. 30c.
☐ Monograph No. 72. Oscar L. McCulloch. A Report on Three Cases of Aniseikonia. 8 p. + cover. 25c.
☐ Monograph No. 198. Max Schapero. Aniseikonia Due to Changes in Corneal Curvature Caused by a Dendritic Corneal Ulcer. A Case Report. 8 p. + cover. 25c.
☐ Monograph No. 187. Arene T. Wray. Clinical Report on the Correction of Aniseikonia in Cases of Low Refractive Error. 8 p. + cover. 25c.

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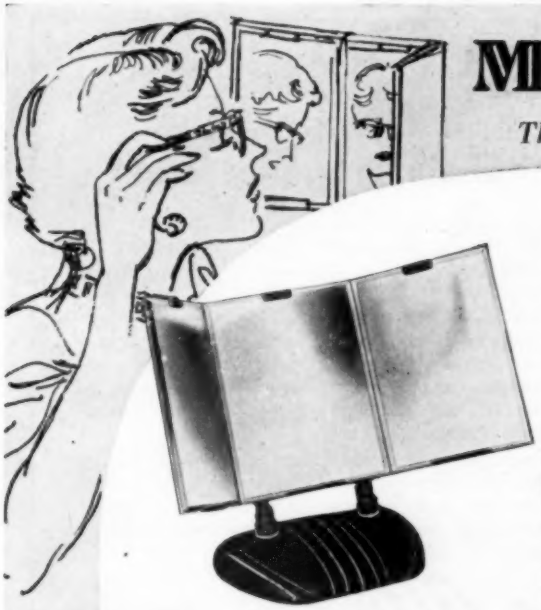

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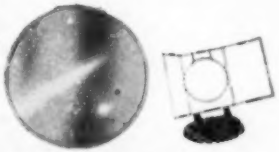

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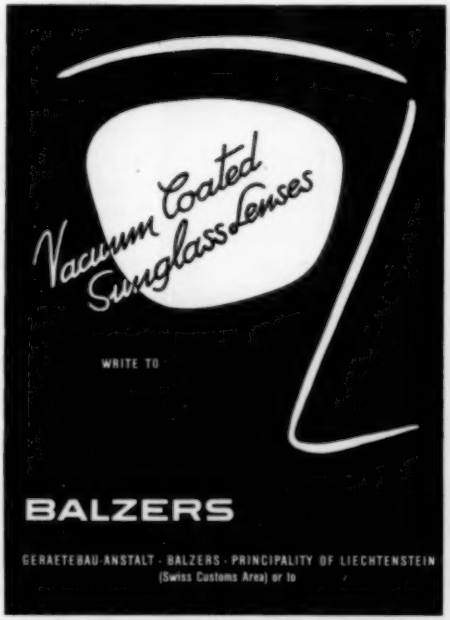

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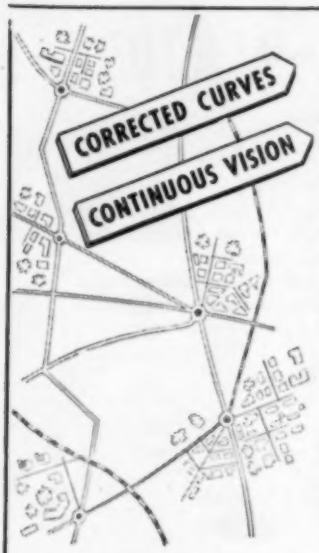

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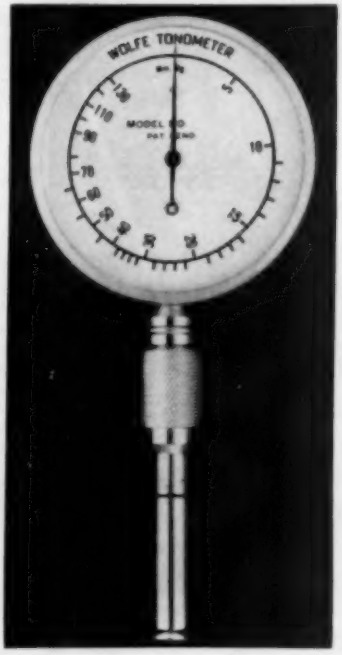

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